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AN ANALYTICAL AND STATISTICAL REVIEW OF ONE THOUSAND CASES OF HEAD INJURY.

(*Continued from Page 477*)

BY CHARLES PHELPS, M.D.,

OF NEW YORK CITY,

Surgeon to Bellevue and St. Vincent's Hospitals.

CONTUSION.—Intracranial contusion may be either of the brain or of the meninges, and in either structure may be limited or diffuse; and when diffuse either one is always accompanied in some greater or lesser degree by an implication of the other.

General Contusion of the Brain.—This condition is usually most marked in the cerebrum, and its manifestations are largely dependent upon injury of that region. If infrequent as an absolutely isolated lesion, it is often practically uncomplicated, being associated only with some minor extension to the meninges. Neither its constancy nor its essential importance have been generally appreciated. This has been due in part to careless and insufficient post-mortem examination, and this again to a still too general acceptance of a theoretical basis of functional disturbance as an adequate explanation of symptoms. The obvious structural alterations are a distention of the parenchymatous vessels, a formation of minute thrombi, the presence of punctate extravasations, and a more or less distinct œdema. All or a certain number of these pathologic

conditions may be seen upon even casual examination. They have been very generally unsought or disregarded, and in the absence of hemorrhage or laceration a contused brain has been pronounced normal.

A more or less intense hyperæmia is often the only gross lesion discoverable. More often careful examination will disclose minute thrombi scattered through the brain surfaces, perhaps generally and uniformly; or they may be in greater part confined to one or more cerebral areas; or, however distributed, but few in number. These thrombi are characteristic of the traumatic form of cerebral hyperæmia. The punctate extravasations are much less frequent in the general than in the limited form of contusions. Œdema ocurs in variable amount, sometimes appreciable only by close inspection, or following section and after some delay; or again it may be so profuse that the fluid may be squeezed from the brain as from a sponge; it may be confined to the brain substance or may distend the lateral ventricle; and, as in one instance, it may enormously dilate the iter e tertio ad quartum ventriculum and extend into the fourth ventricle. The hyperæmia and œdema both may be very well marked, but there seems to be no definite relation in their extent; either one may be greatly in excess of the other. The œdema is more readily explicable as a simple exudation from distended or obliterated vessels; but experiments made by Cannon [9] seem to establish its dependence upon osmotic pressure.

Since the observation of the present series of cases was begun much has been done to elucidate the intimate pathology of this form of intracranial injury. The primary symptoms are those of shock, though differing in essential particulars from general shock dependent upon irritation of the spinal sympathetic system. The nature of the impression transmitted from the exterior which precedes vascular congestion could formerly be inferred only from symptoms and analogy. The discovery by Obersteiner (1897) that in addition to muscular fibres intracranial vessels even in their minute subdivisions possess filaments which endow them with the power

[9] Am. Journal of Physiology, 1901–2, pp. 103 *et seq.*

of contraction and dilatation, and that they easily become paretic, confirms an inference that the effects of external violence upon the cerebral sympathetic system may produce a cerebral vasomotor depression similar to that which has been noted for the general circulation through the spinal ganglionic centres. Cannon, however, attributes the primary cerebral anæmia to an increased intracranial pressure which is produced at the moment of injury and is sufficient to check the flow of blood into the brain. The normal vascular condition may be restored without further appreciable aberration, and the patient may recover with only transitory symptoms; but if violence be greater, and the primary nervous impression correspondingly severe, anæmia is followed by hyperæmia. This secondary stage of circulatory disturbance may be recognized at the very earliest practicable post-mortem inspection, and probably begins at once. It may be assumed to result from a paralytic dilatation of the capillaries; and stasis, thrombosis, and punctate extravasation ensue with some progressive increase of intracranial tension, which is still further and more markedly increased by an œdema of the cerebral tissue. The œdema has been very generally ascribed to simple transudation from circulatory arrest, analogous to that caused by obstruction of a vein in the general circulation. The experiments of Cannon show that this result of circulatory defect is less direct. His conclusions are: That theories which regard cerebral œdema as a passive effusion are untenable; that the vascular obstruction deprives the brain of a normal blood supply and thus causes impaired nutrition, especially through a deficiency of oxygen; that the defective nutrition is characterized by active chemical processes which result in increased osmotic pressure and the passage of water into the tissues; that this is the essential cause of the secondary pressure symptoms.

The earlier theories of cerebral changes following external injuries began with the supposition that a hemorrhage, which was regarded as a foreign body, diminished intracranial capacity and thus compressed the brain. Successive areas were supposed to be invaded until the whole brain became involved, and death ensued from obliteration of the bulbar

capillaries and bulbar anæmia. The fact that the same general vascular and nutritive changes occur without the intervention of a hemorrhage or other indications of localized injury is an evidence that they were diffuse from the beginning, and not the final result of a series of extensions through the formation of vicious circles; nor is death always due to bulbar anæmia, nor are all the secondary symptoms those of pressure. It would seem that Cannon might have gone further in deduction. The same deficient blood supply which so disturbed the nutritive processes of the cerebral cells as to cause an abnormal watery transudation could hardly fail to prevent or destroy their normal functional activity. Scagliosi, quoted by Cannon, found, after repeated slight concussions experimentally made, changes in the brain cells varying according to the duration of life. These consisted in varicosities of the dendrites, swelling of the cell body with the formation of vacuoles, and a more and more homogeneous appearance, ending in an almost entire disappearance of the nucleus. If normal structure is essential to normal function such conditions as these are sufficient to account for all attendant symptoms. Primary or secondary loss or impairment of consciousness may be explicable by pressure alone; but aside from so-called pressure symptoms there are others, such as high temperatures, mental decadence, and aphasia, which occur and are indefinitely prolonged, even to the end of life, without indications of pressure.

It may be that defective blood supply alone causes the retrograde metamorphosis of the cells; but it is not justifiable to assume that anæmia is the sole cause, or even that it is invariably operative. It is not improbable that the same primary impression made upon the vasomotor filaments which occasion circulatory derangements may at the same time originate the decadent nutritive processes which go on to cellular disintegration. This supposition is rendered the more probable from the fact that pressure symptoms are only secondary and may be long delayed.

A case in this series heretofore published [10] is suggestive

[10] *Lib. cit.*, Case CXXI.

of cellular changes independent of the circulatory influence. There were well-marked indications of central injury, as loss of consciousness, irregular respiration, unsymmetrical radial pulsations, papillary disturbances, etc.; and death one and one-half hours after admission to the hospital, followed by a rise of temperature of 10.5° post mortem. There was only moderate pial and cerebral hyperæmia, with no punctate extravasations or minute thrombi, but with excessive œdema of all parts of the brain.

In cases of recovery the circulation is readjusted, thromboses, punctate extravasations, and œdema are reabsorbed, and cellular nutrition is restored to normal conditions. There is no means of determining at what pathological point these reparative processes cease to be possible; and the length of time within which they may be deferred and still be practicable is exceedingly uncertain. The severity of symptoms does not always presage their duration; primary or secondary unconsciousness may last for many days, and high temperatures be long continued; but there is a limit of temperature beyond which recovery seems to be impossible and when death is not far away.

Limited Contusion of the Brain.—This does not differ pathologically from the diffuse lesion except, as its name indicates, in the extent of tissue involved. It may be single or multiple, cortical, subcortical, or both, and may vary in size from the fraction of an inch upward, and affect any region of the brain. The hemorrhages are in punctate form and are its most characteristic feature. The œdema, which probably exists, is so soon generally diffused as to be evident only when the area involved is comparatively large.

The lesion when cortical is usually small and situated more often than elsewhere in the temporal region or in the middle or anterior basal fossa. It is obviously a simple bruise, without arachnoid laceration. Its surface is depressed, softened, and variously discolored from a dark red to a yellowish gray. If subcortical the lesion will be larger, marked by more or less scattered punctate extravasations, and more rarely with than without a yellowish stain of the intervening tissue;

when of considerable extent its glistening surface will indicate the existence of œdema. If more than a single lobe is implicated the contusion may be considered general. The superficial injury is almost always an incident of a general contusion and of itself is probably without importance. The subcortical contusion as its extent increases approximates the general lesion. The minute structural changes are the same, and its general symptoms should differ only in degree. Its only special symptoms are those which indicate the inclusion of special centres of control.

LACERATION OF THE BRAIN.—This is the final expression of force in its greatest intensity. It may be single or multiple, cortical or subcortical, primary or secondary, trivial or important. If less absolutely constant than general contusion, it is even more frequently an emphasized and consequently recognized lesion. In its primary form it is most frequently cortical, and like contusion and probably for the same reasons, it most frequently occurs in the temporal region or in the middle or anterior basal fossa; but it is limited to no region of the base or vertex. Subcortical laceration is no less varied in its site. There is no ganglion or convolution which may not be wounded. This series of cases affords examples of laceration, not only of all cerebral and cerebellar regions, but of the pons, medulla, optic thalamus, corpora striata, and olfactory bulbs; and even instances of limitation to the fornix or gyrus fornicatus. Lacerations when superficial, like limited contusions and basal fractures, if not produced at the point of impact are usually situated at the opposite pole of the diameter through which force is applied, and when subcortical are usually in the course of that diameter.

Cortical lacerations may be insignificant in size, or may involve the whole basal aspect of a frontal or temporal lobe. They may occasion but little hemorrhage even when of great extent, or again with a smaller wound the extravasation may cover the whole brain and fill all the basal fossæ—depending upon the size of the vessels ruptured, and it may be upon other conditions. The wound itself is ragged with shreds and

granular detritus of brain matter underlying broken coagula, and after a time may become pultaceous, yellowish or greenish gray in color, and of septic appearance; or in old cases it may sometimes be found lined with a smooth dark-colored membrane which seems to be in process of organization. Its margin is often softened and dotted with miliary extravasations. The arachnoid membrane will be ruptured unless the wound is small. The subcortical laceration is an irregular cavity filled with coagulated or semicoagulated blood, and when cleared of clot is seen to be fringed with long shreds of tissue. It is sometimes of enormous size, excavating an entire lobe, or opposite lobes, or even an entire hemisphere. It may have been originally a small direct laceration, but more probably a slight intracerebral hemorrhage which by its persistence has gradually disintegrated surrounding tissue. It sometimes happens that after the lapse of one or two or more days the disintegrating process involves a vessel of considerable size and a small laceration is suddenly converted into one of great extent, with an equally sudden change of symptoms. These excessive intracerebral hemorrhages may remain enclosed in a mere cortical shell, or they may break through the cortex and spread over the surface of the brain.

A very unusual condition of subcortical laceration was observed in one case of this series. The temporal lobe was largely excavated and the blood had broken through the cortex at only one point. The cavity of laceration was filled in part with a dense black clot, and in part by a detached mass of reddish-brown disintegrated brain tissue, about two inches long, three-fourths of an inch wide, and one-half inch thick. The cortical hemorrhage was extensive and the brain moderately hyperæmic and œdematous. The patient had fallen fifteen feet to the pavement and died the following day.

It is evident from many cases of compound fracture of the vertex, and from others with extrusion of brain matter from the ear, that recovery may follow cortical laceration. It is also certain from the evidence afforded by occasional necropsies that immediate recovery has followed these lacera-

tions. There were four such instances noted in the present series of cases, in each of which death had resulted from more recent injury. These were:

I. Deep laceration of inferior surface of a temporal lobe, one inch in its diameters, with irregular outlines, lined with a greenish-yellow viscid substance, and surrounded by an area of yellow softening. Previous history unknown.

II. Small cavity in parietal lobe communicating with lateral ventricle, the surface of which was softened, watery, and of a greenish color, and was found later to consist of a fine neuroglia without cells and with only a few capillaries. The intracranial injury had been received four years previously.

III. Shrunken depressed cystic cavity at upper extremity of fissure of Sylvius, extending into cerebral substance to within 5 mm. of the roof of the lateral ventricle; 3.1 cm. in depth and 1.4 cm. in breadth; surrounding tissue sclerosed, and convolutions contracted and atrophic; general sclerosis with marked frontal atrophy. The patient was said to have been injured ten years previously.

IV. Canal lined with blood-stained membrane extended from the cerebral surface between frontal and ascending parietal convolutions to the site of a bullet projecting through the cortex near the median line. The patient was shot four years previously. There was also a laceration of the first and second temporal convolutions, with clean surface and rounded edges, at the site of a trephination made some months before death.

The reparative changes which must precede possible cicatrization are: Formation and organization of a cyst wall, liquefaction and absorption of the clot, contraction of the cyst, and its final obliteration. The formation of a cyst and the liquefaction of the clot have been often seen in operations for epilepsy following former intracranial injuries, and the subsequent contraction of the cyst is noted in one of the instances just cited; but traces of its final obliteration have not been observed in the course of necropsies made in the present series of cases.

It is not probable that large subcortical lacerations often end in the recovery of the patient, since these cavities are so rarely seen in later post-mortem examination. It may be assumed that they do not cicatrize, since there is no record of a cicatrix having been found post mortem with the history of

a former intracranial lesion—a very small cicatrix might escape detection, but hardly one of appreciable size. How often smaller lacerations, whether cortical or subcortical, have occurred in recovering cases which are subsequently lost to view it is impossible to estimate. The lack of distinctive symptoms which permit the differentiation of general contusion from laceration, as well as the fact that laceration is always attended by general contusion, prevents positive knowledge.

CONTUSION OF THE MENINGES.—Meningeal contusion may be either of the dura mater or pia mater, or as in case of other lesions they may complicate each other.

Contusion of the *dura mater* is usually manifested by hemorrhage derived from rupture of the dural vessels or venous sinuses, or by sinus thrombosis. In exceptional cases the dura may be congested or even inflamed. The dural hemorrhage is usually the only source of an epidural hemorrhage which occurs independently of cranial fracture. Thromboses were occasionally found in each of all the sinuses. These were sometimes of very recent, or possibly even post-mortem formation; and sometimes, as shown by their firmness and decoloration, antedating death by a considerable period. The larger number of them are to be ascribed to direct injury rather than to contusion. This is evident in cases in which the sinus wall is torn by an osseous fragment or contused in a line of fracture. The superior longitudinal sinus is thrombosed in this way not very infrequently in connection with fracture of the vertex, and the lateral or cavernous sinus more rarely with fracture of the cranial base. Instances of thrombosis from direct injury of the sinus wall are to be found in cases of this series heretofore published, and might be cited from among those of later occurrence.

Thromboses which occur independently of direct injury, pressure, inflammatory process, or infection, have been considered difficult if not impossible of explanation. A recognition of the far-reaching effects of intracranial contusion renders their occurrence entirely comprehensible. The minute thrombi which it occasions in the minute vessels of the brain

and pia mater are simply replaced by a large thrombus in a correspondingly larger vessel. The denser structure of the sinus wall prevents dilatation as it does rupture or punctate extravasation; and the paucity of nutritive processes affords no sufficient grounds for œdema. The adequacy of this explanation is made still more manifest by exclusion. There are not only cases in which no injury of the sinus wall is discoverable, but there are others in which there is no fracture in the same region of the cranium, or even no fracture at all—and this in the absence of inflammation or infection, and with a clot of obviously ante-mortem formation. The number of cases of this character is not large, probably not more than a half dozen in the whole series. The notes of necropsies which follow are illustrative.

I. No fracture; no hemorrhage; no lacerations; general cerebral contusion indicated by hyperæmia, moderate œdema, and thrombosis of minute vessels which involved the basal ganglia, pons, and cerebellum; no punctate extravasation; decolorized thrombus in each lateral sinus extending into inferior petrosal sinus and jugular vein; thrombosis of ophthalmic vein.

II. Direct basal fracture confined to middle fossæ; epidural hemorrhage in one middle fossa; cortical hemorrhage covering opposite temporal lobe and superior cerebellar surface; general pial and cerebral hyperæmia and thrombosis; firm thrombus in each lateral sinus.

III. Direct basal fracture confined to one side of the cranium; dura mater greatly congested in its posterior two-thirds; small white clots in anterior half, and red clots in posterior half, of the superior longitudinal sinus; thick subarachnoid purulent effusion at base, and seropurulent effusion at vertex of the brain; pus in middle ear on side of fracture.

There was no reason to suspect in any case save two the existence of a special sinus lesion prior to its disclosure in the course of operation or post-mortem examination. In these two instances there was paralysis of all the ocular muscles, and in one case impaired sensation in the course of distribution of the first and second branches of the fifth nerve. Diagnosis of a thrombus in the cavernous sinus, compressing the third, fourth, and fifth nerves in their passage through its walls, was made by Dr. P. A. Callan. There was fracture of the cranial base, and other suggestive conditions, in both cases; but abso-

lute confirmation of the diagnosis was lacking in the absence of opportunity for post-mortem inspection.

It might perhaps be expected that thrombosis of the lateral sinus would be recognized from symptoms, as it sometimes is in cases of middle-ear disease; such has not been the case, whether from urgency of other conditions or for other reasons.

Contusion of the Pia Mater.—This is the more distinctive form of meningeal contusion, and more closely resembles the cerebral injury of which in some measure it always forms a part, and to which it is usually proportionate in degree, but not necessarily in extent. It is often general and uniform when at the same time the cerebral lesion is essentially confined to one lobe or one hemisphere. Like cerebral contusion it is limited or diffuse, and is indicated by hyperæmia, thrombosis, punctate extravasations, and œdema; unlike the cerebral lesion it may occasion a diffuse hemorrhage without gross laceration of tissue. This hemorrhage as was previously stated occurs in patches, in a thin sheet spread over the vertex, or in quantity sufficient to break through upon the cerebral surface or into the arachnoid cavity. It is the form in which pial contusion most frequently becomes a source of distinctive danger; and it was in noticeable amount in about 30 per cent. of all the necropsies made. The punctate extravasations are more numerous than in cerebral contusion, often become petechial, and largely replace the minute thromboses. The greater proneness to hemorrhage in pial contusion is explicable by the structural peculiarities of the pial membrane. Its vessels are larger and more numerous, and the loose areolar meshes in which they subdivide afford inefficient support in time of stress from active dilatation.

The pial œdema, which is the analogue of the cerebral transudation, may be confined in the areolar interstices of the membrane as it is held in the connective tissues in case of œdema elsewhere, and diffused over a considerable part of the vertex or of a hemisphere; or it may be circumscribed in scattered areas of very limited extent. It more characteristically occurs as a subarachnoid effusion which may cover the

whole brain, but more frequently the vertex alone; or a hemisphere or even only one or two lobes; and it is a clear or slightly opalescent fluid. It is not only of much less frequent occurrence than pial hemorrhage, but is probably still less frequent as an essential or even largely contributive factor in determining a fatal result. It does not seem to modify in any recognizable degree symptoms of severe cerebral contusion, with which it is always complicated. Any operation based upon its supposed existence and importance therefore must be purely empirical.

There is no reason to suppose that the origin of these structural changes is other than the same shock of external violence impressed upon the cerebral vasomotor centres which produced similar changes in the brain substance.

Secondary Pathological Changes.—The vast majority of cases of intracranial injury end in recovery or death from the direct effect of the primary lesion; but in the minority, certain other pathological conditions may intervene between the primary contusion and the ultimate issue of the case. These are inflammatory or degenerative, and as they affect the brain substance are: *softening, sclerosis,* and *abscess.*

Softening.—This does not occur in large areas involving the central regions of the brain, as happens in idiopathic cases resulting from atheromatous degeneration, or from embolism or thrombosis of large vessels. It is always practically confined to the cortex, and is often but not always inflammatory. It is then only an incident in a meningeal inflammation with which it may be co-extensive, and is a nutritive defect explicable through a community of vessels by direct anastomosis. The hemorrhagic form, which often occurs in multiple areas, is also a part of an injury of wider extent, and was noted in many cases of pial contusion with petechial hemorrhages which involved the cortex, or with superficial lacerations or limited contusions. It did not usually extend for more than 1 to 3 cm. into the brain substance, though in one instance it was prolonged through a parietal lobe from the fissure of Sylvius to the posterior commissure. Its superficial extent was small,

or at the most but very moderate—from a few millimetres to in one instance the whole of the inferior portions of the three frontal convolutions, which were infiltrated with blood.

The softening of the margin of large subcortical lacerations which occurred when death was not immediate, was variously inflammatory, hemorrhagic, or œdematous.

A fourth form of superficial softening was occasionally observed, which resulted from contact with subarachnoid or ventricular effusions; and in one case the surface of the third left convolution was softened and eroded by the pressure of a hæmatoma. These secondary changes may be discovered at the earliest period of post-mortem inspection.

Sclerosis as a sequel of cerebral contusion does not differ anatomically from the same inflammatory condition when idiopathic or congenital. It is the result of a subacute grade of inflammation with progressive increase of neuroglia, concurrent cellular destruction, and ultimate atrophy. It is attended by other meningeal and cortical lesions which perhaps measure the severity of the deeper contusion. It may begin soon after the receipt of injury, but probably only in exceptional cases, though it should be said that it was not especially looked for in cases which terminated in a very early period. The beginning of sclerotic change was noted in one instance in a general increase of neuroglia when death had occurred on the seventh day; and in another case, when death was on the twenty-fifth day, the left frontal lobe had already become perceptibly atrophied. How frequently it may exist in those cases in which with decadent symptoms the patient survives intracranial injury for a considerable length of time is quite uncertain, since post-mortem examination is not usually made. It may effect the brain generally or be limited to a single hemisphere, or to a single lobe as it was in some of the cases cited in illustration of frontal localization.[11]

The sclerosed part in accordance with the extent of structural change will only be slightly firmer than normal, or indurated and atrophied in some greater or lesser degree.

[11] Phelps: Am. Journal of Medical Sciences, April–May, 1902; March, 1906.

A case of sclerosis and atrophy of the temporal lobe previously cited [12] was especially notable. The primary symptoms were delirium and a single convulsion; six months later an operation for fractured patella was followed by wild delirium and convulsions; and one month later still, a second operation was again followed by delirium and convulsions, and by death on the second day. The right temporal lobe was found to be indurated, pigmented, shrunken to less than one-third of its normal size, and of dense fibrous structure with no trace of resemblance to brain tissue. A cortical laceration, 3½ x 1½ inches in its diameters, involved the whole of the second and third and a little of the first temporal convolutions. There was also a laceration of the anterior border of the right frontal and one of the second and third orbital convolutions of the left frontal lobe. All of these lacerations were necrotic.

In another case also previously cited [13] the patient survived more than two years. In this instance atrophy was limited to the anterior part of the brain, and to a very great extent to the left frontal lobe; and there was direct evidence of primary lesion of the brain tissue.

Secondary inflammations have essentially the same pathological history whether the brain tissue or its membranous investment is the part affected.

The direct infection of compound fractures, and through them of subjacent intracranial structures by continuity and a community of vessels, is part of the common history of all infected wounds. In this way limited or diffuse septic inflammations of the dura mater, arachnoid membrane, and cerebral cortex or even subcortex, may successively occur. Their mode of development and their subsequent extension do not differ from those of the same pathic condition when otherwise produced.

The indirect infection of distant parts which has been considered in some detail in a former study of the subject [14]

[12] *Lib. cit.*, Case CXLVII.
[13] *Lib. cit.*
[14] *Lib cit.*, edition of 1900, pp. 69 *et seq.*

causes inflammations of the same character as those which originate by direct transmission through contiguous structures. These are: A parenchymatous inflammation of the subcortical brain substance resulting in abscess, usually limited, but in at least one instance diffuse, and a limited or diffuse inflammation of the arachnoid membrane, in which the inflammatory products are found in the arachnoid cavity or in the subarachnoid spaces and in the tissues of the pia mater. Their dependence upon an invasion of pathogenic germs from without or from some other part within the body is beyond question in cases of cerebral abscess and of the suppurative form of arachnitis. It has been averred that traumatic cerebral abscess is invariably attended by cranial or extracranial wound. This contention is disproved as an absolute rule by at least exceptional cases. There are other channels of invasion, notably the vascular, which are no less accessible to these germs after an intracranial injury than when the intracranial contents are still intact.

There is in all cases in which suppurative inflammation is of this indirect character a direct traumatic lesion which is essential, and a later infection at its site which is accidental. These are the fundamental factors in their pathology—a diminished power of resistance in a part weakened by a primary traumatic lesion, and its natural selection as a point of attack by predatory pathogenic germs. Observation and inference have so well established this relation of the primary to the secondary lesion that it may be assumed to exist in every instance until proof to the contrary be adduced.

Notwithstanding all the possibilities of infection—the existence of a superficial wound or fracture, the frequent surgical want of cleanliness, the neglect or imperfection of early or late aseptic or antiseptic treatment—its actual occurrence is infrequent.

Cerebral abscess occurred in twelve cases, one of which was superficial and an incident in the history of a neglected compound fracture; and another which was more properly a diffuse encephalitis than an abscess. They constituted practically 1 per cent. of the total number of 1000 cases.

SUMMARY OF ABSCESS CASES.

	Cases	Recovered
Abscess complicating fractured base.....	4	1
Abscess complicating fractured vertex.....	8	3
Recoveries		33%

In at least 3 of these cases and probably in two others abscess had already formed.

Probable Route of Infection.—Through compound fracture, 9; through ear, 2; through sloughing points in the scalp, 1.

Associated arachnitis, 6 (probably primary, 4).

Region Infected.—Frontal lobes, 5; frontal lobes and lateral ventricles, 3; lateral ventricles, 1; parietal lobe, 1; occipital lobe, 1; diffuse, 1.

The case last mentioned is so unusual in character, if not unique, that it will be cited at length.

CASE XXIX.—A lad ten years of age was knocked down and run over by a truck. On admission to Bellevue Hospital he was unconscious; temperature 96°, pulse 122, respiration 28. His face was contused and bleeding and his left femur fractured. There was hemorrhage from the nose, mouth, and right ear; and hæmatemesis. On the third day he had double internal strabismus, frontal headache, and great restlessness. On the fourth day in the afternoon his temperature rose from 99.8° to 103.6°, and afterwards remained high with morning remissions and afternoon exacerbations. No note was made of his mental condition until the sixth day, when he is said to have been somnolent with a cessation of headache and lessened restlessness and strabismus. On the ninth day there was some cervical rigidity; on the eleventh day lumbar puncture was made without result; and on the thirty-first day he was sent home.

During his stay at Bellevue he was at times quiet, rational, and somnolent; but oftener noisy, restless, irritable or delirious, and crying throughout the day or night because of pain in his head; vesical and rectal control was retained; vomiting or inability to retain nourishment was only an occasional occurrence. No medication was employed except an occasional cathartic and on two occasions ¼ gr. codeine.

He was in care of a private physician for six days, and is said

to have emaciated and to have been "apparently in a state of coma."

On the thirty-eighth day he was admitted to St. Vincent's Hospital. His temperature then was 102°, pulse 112, and respiration 30. He was very restless, hyperæsthetic, and could be aroused only with difficulty. His mental condition remained unchanged until the seventh day, and from that time he was conscious, but manifested no sign of intelligence; vesical and rectal control was lacking at all times; the muscular condition was normal except for one day, when the extremities were rigid on attempt at flexion of the larger joints. His temperature became normal on the third day, rose to 102° on the fifth, fell to normal on the sixth, and was afterwards subnormal till his death on the ninth day—the forty-seventh from the time of injury.

Ocular examination by Dr. Callan disclosed neuritis in the right eye; the retina of the left eye was concealed by an old corneal opacity. Lumbar puncture yielded a turbid fluid which contained no pus.

On the fourth day, while his earlier history was yet unknown, he was trephined on the supposition that there might be a subacute arachnitis with large serous effusion. The dura mater was found to be closely adherent to the bone, apparently from pressure, but there was no effusion into the arachnoid cavity. The cortical surface was tense and feebly pulsating, and its vessels were distended.

LESIONS.—*Fracture.*—Essentially confined to the cranial base; closed fissure began in the left superior occipital fossa, ran inward through left interior occipital fossa, crossed the median line and inner third of right petrous portion, became open, and ran through the right middle fossa to terminate in the centre of the squamous portion. *Intracranial hemorrhages,* none. *Arachnoid cavity* contained no fluid. *Limited contusion*—a single one which was small, superficial, and of the inferior surface of the left temporal lobe. *Brain substance* upon superficial section was markedly hyperæmic and œdematous; and upon deeper section the whole right parietal and occipital lobes were found to be converted into a single enormous cavity filled with seropus; the left occipital lobe was similarly excavated and was filled with turbid serum and a thick green pus, the latter in large proportion; the frontal lobes were hyperæmic and œdematous, having escaped infection.

Ventricles.—The lateral ventricles were enormously distended with a thin seropurulent effusion which held in suspension flakes of thicker pus. This same fluid filled the fourth ventricles, excavated a wide canal through the pons varolii, largely accumulated in the posterior basic fossæ, and extended into the spinal canal. The posterior border of the cerebellum and its median fissure were superficially infiltrated with pus. The infecting germ was the *Staphylococcus pyogenes aureus.* There can be little doubt that the primary lesion was a general contusion and œdema of the brain substance, and that it was this watery effusion which was the direct seat of infection. The general character of the infiltration and predominance of serum over pus, and the œdema of regions not infected, point to this conclusion.

Pachymeningitis is the most infrequent form of traumatic intracranial inflammation. There were four cases altogether —two which were external and two which were internal. The two cases of pachymeningitis externa were in each diffuse, and resulted from infection through an external wound engrafted upon an old idiopathic inflammation of alcoholic origin. The instances of pachymeningitis interna were part of a general septic inflammation of the intracranial contents; and the infection was doubtless through the pia mater and the arachnoid membrane.

The puffy tumor described by Percival Pott, in which a cranial contusion was followed by necrosis and a limited pachymeningitis with abscess, has no longer reason to exist and has probably ceased to occur.

Acute arachnitis occurred in twenty-one cases, nearly twice as many as there were with cerebral abscess, or about 2 per cent. of the total number of 1000.

Complicated with basal fracture	14
Complicated with fracture of vault	3
Complicated with simple intracranial injury	4
	21

There were extracranial wounds in thirteen cases, including two of the four in which there was no fracture, and four in which the wound was gunshot.

The route and manner of infection seems evident in a majority of cases, as shown in the following table.

ACUTE ARACHNITIS WITH FRACTURE OF THE CRANIAL BASE.

Infection before admission (positively known)	1
Mastoiditis	1
Penetrating fracture of orbit	2
Complicated fracture involving ethmoid cells	1
Complicated fracture—wound, stuffed with soiled rags	1
Complicated fracture—gunshot (ball extracted from nose in one)	2
Complicated fracture with hemorrhage from the nose	2
A fracture through anterior fossæ (with hemorrhage from the nose)	1
Wounds of the scalp	1
Inexplicable	2
	14

With Fracture of the Vault.

Complicated fractures (1 homicidal—multiple; 1 gunshot)	3

With Simple Intracranial Injuries.

Mastoiditis	1
Unknown injury one month before admission	1
Recent infection before admission	1
Wounds of scalp	1
	4

Six cases, which comprise compound fractures, simple wounds of the scalp, and fractures with hemorrhage from the ear, afford an appreciable route for infection; but with no appreciable reason for its occurrence. They were, so far as known, given the same aseptic care as the much greater number of others which escaped; whether infected before admission or by some lapse in treatment afterward must remain in doubt.

The two cases which are enumerated as inexplicable were without wound or extracranial hemorrhage. One was admitted to the hospital on the fourth day after receipt of injury, unconscious and with a temperature of 104°; and the other, without obtainable history, had spastic muscles and a slightly subnormal temperature. They died respectively on the second and third days after admission. The first upon necropsy was found to have

cranial fracture extending from a point beneath a temporo-occipital hæmatoma through both middle fossæ and the sella turcica, excessive cerebral hyperæmia and moderate œdema, and a seropurulent effusion in an area not more than one inch in diameter. The second had fissures confined to the posterior basal fossæ, laceration of the inferior surface of a frontal lobe with marked hemorrhagic softening, cerebral hyperæmia; subarachnoid serous effusion over the entire base of the brain, and a small area of seropurulent effusion over each frontal lobe. In each case the effusion was insignificant in amount and the mild infection seems from the history to have occurred prior to the patient's coming to the hospital.

The arachnoid inflammation was general, covering the whole vertex and base, in only five cases; in twelve others it covered one-half or more of the brain, anteriorly, laterally, or at the base or vertex alone; and in the three remaining cases it was confined to one or more very small areas. The effusion in some cases was wholly purulent, and in others was diluted with serum and occasionally mingled with shreds or granules of fibrin.

The essential factors in the causation of acute arachnitis, as of cerebral abscess, are a primary contusion and a secondary infection. There is this single pathological difference, that while the abscess is usually circumscribed the arachnoid suppuration is often diffuse, and may involve the entire membrane. Its strict limitation in other cases to small areas of contusion demonstrates the effect of a primary lesion in determining the site of infection as in the following instances:

I. Seropurulent effusion confined to an area of not more than one inch in diameter upon the posterior border of the cerebellum.

II. Seropurulent effusion confined to two areas, each two by two and one-half inches in diameter and situated over a frontal lobe.

III. Four areas each about two inches in diameter with arachnoid opacity and subarachnoid sanguinolent effusion.

IV. Several small purulent effusions in different cerebral regions.

V. Posterior half of the pia mater and arachnoid mem-

brane covering the vertex excessively hyperæmic; anterior half opaque, with subarachnoid seropurulent effusion flattening the convolutions and obliterating the sulci.

In each of these instances the primary contusion was evident beneath the subarachnoid effusion.

Subacute Arachnitis.—This occurred in thirteen cases. There was also a small number of cases in which a serous effusion might have been to some extent inflammatory, but in which its origin was still questionable. The inflammation was general in all but one, and in that one extended over two-thirds of the cerebral surface. There was no fracture in nine cases, though in eight there was extracranial wound with or without fracture.

The anatomical appearances were very like those of meningeal contusion with non-inflammatory subarachnoid effusion. The distinction was made by the cloudiness or turbidity of the serous effusion and by the opacity of the arachnoid membrane. These characteristics were more or less well defined in different cases, or either one might be absent. In one instance the serous effusion was wanting while there was great arachnoid opacity over the whole superior cerebral and cerebellar surfaces; in another the serous effusion was turbid with no loss of arachnoid transparency; and in a third there were patches of fibrin over the left frontal lobe and along the median fissure, and a membranous exudation covering the pons, medulla, and inferior cerebellar surface, with a turbid serous effusion confined to the lateral ventricles. Sometimes the membranes were locally adherent to each other, and sometimes when inflammation was long continued in connection with a cerebral sclerosis they were much thickened.

Histological examination was made in only a minority of cases, and in them there was no evidence of pus—only small round cells which also infiltrated the cerebral cortex. This grade of inflammation, which is amicrobic, is ascribed by Gouley [15] to the irritation of dead atoms which have failed of absorption. This explanation is based upon Bland-Sutton's theory of inflammation.

(To be continued.)

[15] See *lib cit.*, edition of 1900, p. 85.

OSTEOSARCOMA OF THE MANDIBLE.*

BY ADDINELL HEWSON, M.D.,

OF PHILADELPHIA.

Professor of Anatomy in Philadelphia Polyclinic Hospital; Surgeon to St. Timothy's and American Oncologic Hospitals.

IN reporting a case of osteosarcoma of the mandible, my object is to point out how it may be possible to remove half of the mandible with the least possible deformity resulting.

As pointed out in many of the text-books, the performance of this operation without ligation of the external carotid is still in practice; but as the patients are usually aged, and since loss of blood without ligation cannot be avoided, it seems best to me to discard the old operation and insist upon the necessity of primary ligation of the external carotid artery.

In doing the operation without ligation, the surgeon must count upon the rapidity of his work and the dexterity of his action and that of his assistants to control the loss of blood. This very often miscarries, and the patient loses a terrific amount of blood. The operation by ligation of the external carotid as a primary procedure and the closure of this wound may be performed without entering into the field of removal of the mandible, even though the bifurcation of the carotid may be as high as the greater cornua of the hyoid bone, provided there is no glandular involvement, as is possible and probable in carcinoma.

This primary ligation, while it prolongs the operation slightly, renders the removal of the mandible much more efficient; and the operator is not impeded by the loss of blood or the possibility of septic pneumonia dependent thereon.

It is argued by some that the artery forceps will control the hemorrhage and save the time of the operator and necessarily the length of the anæsthesia; this some are willing to assign as the cause of the pneumonia rather than the septic material, plus the loss of blood, injury to the part in manipulation, and

* Read before the Philadelphia Academy of Surgery, February 1, 1909.

the non-warming of the inspired air before it enters the lungs. It is known that in the removal of so vital a part as half of the mandible, as in all major operations, the minimum loss of blood, the minimum interference with the temperature of the inspired air, the minimum incision in the removal of any part, and the minimum of time in its performance are all factors tending toward favorable termination.

Having followed the usual course as given in the text-books in former procedures and in the bloody clinical services in which I have been a participant, it seemed possible that the desired end could be reached in carrying out the principles above stated. A suitable case presenting itself at the American Oncologic Hospital, I applied the principles as above outlined.

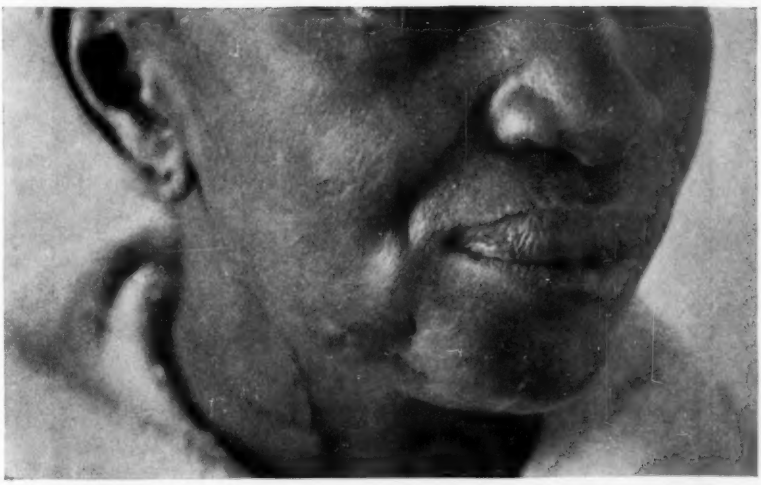
The patient, C. S., colored, aged 36, married, a domestic, was admitted on February 10, 1908.

About ten years ago noticed vague pains in the right side of the mandible. There was no history of any injury from outside sources. The first thing she noticed was a small hard lump in the navel of the sixth-year molar, ten years ago. Eleven months ago, following a bad toothache, she had the lower second bicuspid and sixth-year molar extracted on account of pain. Since the extraction of the teeth the tumor has grown rapidly and was at the time of her admission about the size of an English walnut. In Sept. 1907, ulceration took place on the face; she has had the projection into her mouth removed two or three times since teeth were extracted. The growth on the right side of the body of the mandible occupied the site of the second bicuspid and of the sixth- and twelfth-year molar teeth. This was very dense and occupied the alveolar process and extended caudad into the body of the mandible, and was connected with the outside of the face by a sinus which discharged blood and pus. The growth was seen to occupy the vestibular and buccal surfaces of the alveolar process, and surrouded the first bicuspid and extended to the middle and partly surrounded the twelfth-year molar. Apparently the wisdom tooth had not been erupted. There were no glands anywhere in the submandibular triangle. The thoracic and abdominal organs were all normal. Blood and urinary examinations were made.

Patient was in the house sixteen days under observation before operative interference was considered, and during this time all preparations and examinations possible were made.

On March 19, 1908, the patient was placed under chloroform anæsthesia and the external carotid artery of the right side ligated. The performance of this operation was rather difficult because of the unusual position of the artery. Bifurcation did not take place until the great cornu of the hyoid bone was reached. This of course increased the length of time of the performance of this operation, first because of its unusual position, and second because it was necessary to avoid entering the buccal cavity. The vertical incision was made in the middle line through the lip to the caudal margin of the mandible, dividing all the muscles to the bone. The left inferior coronary artery was ligated; the skin incision followed the caudal margin of the mandible as far dorsal as the position of the facial artery. The levator menti, depressor labii inferioris, depressor anguli oris, platysma myoides, and buccinator muscles were divided by the scalpel, care being taken to leave muscular attachments and not tear away the periosteum. These manipulations extended up to but not through the vestibular fornix of the mucous membrane. The scissors were now substituted for the scalpel and divided the masseter muscle, the stylomandibular ligament, and part of the capsular ligament on the ventral and lateral parts of the condyle. The mandible was divided by a chain-saw, after pulling the right central incisor. The bone was violently depressed and the temporal muscle, severed from the mesial surface and apex of the coronoid process and caudal fornix of the mucous membrane, was now divided, taking pains to adhere as closely as possible to the ventral margin of the ramus and to pass as far cephalad on this margin, thus avoiding all interference with Stenson's duct. The buccal mucous membrane, together with one geniohyoid muscle and the mylohyoid, the internal and external pterygoid muscles, and the sphenomandibular, internal lateral, and the remaining part of the capsular ligaments were divided, severing also in this procedure the inferior dental artery and nerve, the myoid artery and nerve, and their accompanying veins. The half of the mandible was now easily removed by a twisting movement and the free use of scissors close to the bone, the condyle being practically twisted out of its capsule and the socket in the temporal bone. There was decided venous ooze from the pterygoid region, but this was easily controlled by

FIG. 1.



Osteosarcoma of mandible. Appearance of patient before and after removal of the affected half of the mandible.

FIG. 2.

Osteosarcoma of mandible. Portion of mandible removed, and microscopic section from growth.

iodoform gauze packing; all apparent glands were removed. Buccal and vestibular fornices of mucous membrane were united by interupted silkworm-gut sutures. The drainage for forty-eight hours was through the most dependent portion of the facial wound. One and a half metres of iodoform gauze were packed into the interval between the masseter and pterygoid. The sinus in the skin of the face, of course, was cut out and independently sutured. There was slight oozing for forty-eight hours after the operation, but after the removal of the packing and irrigation of the cavity there was no further trouble.

Present Condition.—The patient is not able to adjust the mandibular with the maxillary incisors owing to the contraction of a fibrous band in the position formerly occupied by the removed portion of the mandible.

The patient has no difficulty in masticating soft food; and I have to report at this time that she is in perfect health without any recurrence anywhere, and is under weekly observation, as she is employed about the institution.

I have to submit photographs taken before and after the operation; one of the part removed, an autochrom, microscopic slides of the growth, together with microphotographs (Figs. 1 and 2).

The patient at no time during her entire stay in the institution, before, during or after the operation, except as the reaction after her operation, had a temperature above 99 $^{2}/_{5}$°.

The pathological investigation was made by Dr. John M. Swan, who pronounced the growth a round- and spindle-celled sarcoma of the body of the mandible. The section is composed of irregular trabeculæ tissues which correspond to the trabeculæ of the bone, between which are spaces occupied by altered marrow tissues. In the tissues corresponding to bone trabeculæ there is no evidence of normal bone tissue except out in the periphery of the section. The tissue is composed of numerous large round cells with occasional spindle cells separated by a distinctly fibrillar connection of tissue. The marrow tissue occupying the space is poor in cells and has undergone myxomatous degeneration. There are giant cells in places in the altered marrow tissues. The bone trabeculæ which have not been invaded by the new growth is poor in cells. No canaliculæ are visible, and the matrix looks as though it had undergone myxomatous change.

CONGENITAL MESENTERIC CYSTS.*

BY HARRY C. DEAVER, M.D.,

OF PHILADELPHIA,

Professor of Surgery, Woman's Medical College; Surgeon to the Episcopal and Stetson's Hospitals, and to the Children's Hospital of the Mary J. Drexel Home.

THE rarity of mesenteric cysts, coupled with their interesting and by no means established *status* in pathological anatomy, entitles hitherto unreported cases to a place in the literary annals of the day.

On May 20, 1908, I operated upon the following little patient in the Children's Hospital of the Mary J. Drexel Home:

E. B., aged 7 years, school-girl, was admitted May 19, 1908, complaining of abdominal pain and vomiting. Two years previously she had suffered from a malady then diagnosed as gastritis. Two weeks before admission she suffered with abdominal pain and vomiting. Nine days later, her mother noticed a yellowish vaginal discharge. The pain and discharge subsided, and the patient arose from her bed eight days after onset, but even then complained of soreness in the right lower abdomen, and walked bent forwards. Patient was about for four days, during which time she suffered an attack of pain and vomiting. The night before admission she complained of increased abdominal pain and frequent emesis. The next day brought ease and much comfort, when the bowels moved at 3 o'clock in the afternoon. On admission at 8 P.M. the temperature was 103° F., and the pulse 126 per minute.

Examination revealed slight abdominal distention with bilateral mural rigidity and marked tenderness below the umbilicus. There were points of greater tenderness in both iliac fossæ, these points spanning an area in which two tumors were distinctly felt.

After cœliotomy the tumor was so juxtaposed that at first sight it resembled a distended cæcum over an abscess or a cyst of ovary. Further manipulation however revealed the condition reproduced in Fig. 1. The first cyst seen encroached upon the

* Read before the Philadelphia Academy of Surgery, February 1, 1909.

ileum, and increased the non-peritoneal area of the latter by pushing apart the lamellæ of the mesentery at its intestinal border. This cyst had a diameter of 5 cm. and was situated about 15 cm. proximal to the ileocæcal valve. Close by it, resting on the right aspect of the gut and partly on the anterior lamella of the mesentery, was a second cyst of the same dimension; and adjoining this latter cyst on the right, between it and the first, was a smaller cyst, the size of a bean. A loop of ileum was so related to these two cysts that it was distal to the first and dorsal to the second. A third large cyst was found on the left lateral aspect of the coil of ileum, nearly opposite to the second, but lying more deeply in the right iliac fossa. As the sketch shows, the loop of the ileum was partly throttled by the grasp of the three cysts, and was free only opposite its mesenteric attachment.

As seen by the figure, the cysts and involved loop (25 cm.) of ileum were removed *in toto,* and lateral anastomosis performed. A glass tube in the pelvis sufficed for drainage. The patient was soon on the highroad to recovery and left the hospital June 13, 1908.

Here then was a patient suffering from incomplete intestinal obstruction the cause of which is plainly evident. The abdominal pain was doubtless due to the spasmodic contractions of the laboring intestine. Posture seemingly determined the obstruction, for when the patient was up and about, the latter appeared, but was relieved by recumbency. The mechanical action at play here may be worked out by reference to the sketch.

A case that nearly parallels the above was in the Leeds Infirmary, under Mr. Jessop (cited by Moynihan: *The Medical Chronicle,* September, 1902):

> M. J., aged 6 years, female; admitted June 9, 1892. For three months the child had complained of occasional attacks of sickness and vomiting, with pain across the front of the abdomen; there were two such attacks; and altogether there have been about one dozen. Their frequency has latterly been increasing. . . . A single attack may last a few hours or a few days.
>
> On examining the abdomen there is a trilobed tumor situated almost in the midline. The swelling is dull, but on two occasions a resonant band has been distinguished running across the middle. The area sur-

rounding the tumor is everywhere resonant. The tumor is usually movable in all directions, and can be rotated freely round its central point.

Under ether the tumor was removed. It was found to be a mesenteric cyst and multilobular, each loculus containing clear fluid. The mesentery and intestine were removed and the cut ends of the bowel united by Paul's tubes. The patient made a good recovery.

The cysts above described are the multilocular types of serous cysts, the other type being the simple. But what strange factor determines the presence of such cysts in such an unusual locality? Braquehays (*Archiv gén. de. Méd.*, Paris, September and November, 1892; also *Revue de Chir.*, 1892) classified mesenteric cysts under five headings, and Moynihan (*loc. cit.*) under eight; but Dowd (ANNALS OF SURGERY, 1900, vol. xxxii, p. 515) furnishes the following simple, but scientific, classification: (1) Embryonic cysts, (2) hydatid cysts, (3) cystic malignant disease.

My case fits in the first category, namely, that of embryonic cysts. Moynihan (*loc. cit.*) says: "One may remark with some assurance on the great probability of embryonic origin of most of the cysts found in the mesentery being established. The more closely cysts of the mesentery are studied the more likely does it become that, with the exception of parasitic and malignant cysts, all the forms are embryonic in origin, and are due to "rests" derived from the Müllerian or Wolffian organs or ducts, or from the ovary." Dowd (*loc. cit.*), by reviewing the anatomy of the primitive genito-urinary organs and alimentary canal, shows how easily a sequestration from the Wolffian body, or the embryonic genital gland, could be included between the folds of the mesentery, and proceeds with the statement: "It is altogether within the bonds of probability that such a separation should from time to time take place from the Wolffian body or the germinal epithelium at an early time in embryonic life; and, if such portions are separated, it is not strange that they should be carried into the mesentery, mesocolon, or mesorectum in the course of their development, and there form cysts such as this one or like many of the others which have been described."

FIG. 1.

Cysts of the mesentery.

The first mesenteric cyst was reported as an anatomical curiosity by Benivieni, a Florentine anatomist of the sixteenth century. No more significance was attributed to these cysts from that time until the middle of the past century. From 1850 to 1880, mesenteric cysts were occasionally found at operation when the expected lesion was ovarian cyst. It is only within the past thirty years that systematic clinical studies of these cysts have been made. One of the most meritorious and widely quoted of these studies was that contributed by Dowd (*loc. cit.*) in 1900. The author reported a case of dermoid cyst between the layers of the transverse mesocolon, emphasized the morphological significance of these tumors, offered a new classification, and showed the importance of histological examination of the cyst wall and analysis of its contents. Unfortunately this last could not be done in my case, because the specimen was lost after it was sketched.

The next important contribution was made in 1902 by Moynihan in a paper entitled " Tumors of the Mesentery " (*Mesenteric Chronicle,* Sept., 1902). Moynihan classifies cystic disease of the mesentery under eight headings, and describes examples of each. After a brief *résumé* of the subject from the clinical standpoint, he concludes with a short account of solid tumors of the mesentery. Speaking of chylous cysts, Moynihan says: " These are the most common form of mesenteric cysts, and may arise in two ways: either they are primarily dilated and varicose lymphatic vessels, which, gradually enlarging, form cysts; or they are *primarily serous cysts,* the lacteals bursting into the cyst on account of stretching and thinning of their coats. *The latter mode of origin is, in all probability, the more common.*"

In 1906 appeared a paper by Ayer entitled, " Enteric and Mesenteric Cysts with Report of an Unusual Case (*Am. Jour. Sc.,* Jan., 1906). The cyst in question was situated at the angle formed by the mesentery of the ileum and the reflection of the peritoneum at the descending colon. It was the size and shape of a duck's egg, and occupied the lumen of the cæcum. The cyst contained about four ounces of clear, viscid

fluid. Ayer's cyst was apparently similar in structure and origin to mine, falling, therefore under the heading of serous cysts. Speaking of the origin of the cyst, Ayer says: "Let us suppose that the cyst in question has its origin in the Wolffian body, the Wolffian duct, or Müller's duct. Recognizing the tendency of these 'rests' to undergo cystic degeneration and postulating the existence of such a process in the present instance, it is not difficult to conceive the chain of events, beginning with a tiny retroperitoneal 'rest' *in fœtu* and ending with the same structure which has undergone cystic degeneration, has become many times enlarged, and has migrated between the layers of the mesentery during the development of that structure as far as its attachment to the gut, there pushing before it the structure forming the wall of the intestine, and eventually lying, to all intents and purposes, within its lumen, though, anatomically speaking, outside it." Ayer represents schematically, by five figures, the probable course and final resting place of the cyst. Ayer's patient, like mine, suffered from chronic intestinal obstruction; his cyst, however, encroached more directly upon the lumen of the bowel than mine, since, situated at the cæcum, it had not the same breadth of mesentery in which to develop as had mine, located farther up on the ileum. To Dowd's aforementioned classification into (1) embryonic cysts, (2) hydatid cysts, (3) cystic malignant disease, Ayer adds (4) cysts arising from the glandular structures of the intestinal wall, and (5) cysts of the normally placed retroperitoneal organs. These two minor amplifications were suggested by reports of recent cases.

In 1907 F. Niosi, assistant in Professor Ceci's Clinic at Pisa, wrote an exhaustive monograph entitled: "Mesenteric Cysts of Embryonal Origin, etc.", which was translated and published in *Virchow's Archives* (cxc, No. 2, pp. 217–338). Niosi's cyst lay in the mesocolon, between the anterior leaf of the transverse mesocolon and that of the descending colon. After a most thorough and exhaustive histological examination of the cyst wall and chemical examination of its contents, Niosi attributed its genesis to the Wolffian body upon two

grounds: (1) From the structure of the wall, which was lined by cylindrical epithelium, and contained tubules formed of cylindrocubical cells; (2) from the presence of nodules of suprarenal tissue. Niosi believes there is a similarity between the structure of his cyst and the mesonephron cysts of the broad ligament, and that from this similarity further convincing arguments arise for the origin of the latter cyst from the Wolffian body.

Niosi's classification is: (1) Cysts of intestinal origin proceeding from the concave side of Meckel's diverticulum, which insinuate themselves between the two layers of the mesentery; or cysts from rests which spring from the intestinal wall, and during development have been enclosed in the mesentery. (2) Dermoid cysts. (3) Cysts which spring from retroperitoneal organs, as from the urogenital organs (germinal epithelium, ovary, Wolffian body, Müllerian duct). He collected 44 cases of embryonal mesenteric cysts, which fell into his classification as follows:

1. Cysts of intestinal origin	16
Doubtful cases of cysts of intestinal origin	7
2. Mesenteric dermoid cysts	14
3. Cysts derived from sequestrated anlage of the urogenital tract	5
4. Cases which do not belong in any of the three categories mentioned	2
Total	44

By taking the total number of mesenteric cysts other than embryonal (184, of which Braquehays in 1892 collected 104; Becker from 1892 to 1900 collected 40; and from 1900 to 1907 there were 40 more) and dividing all mesenteric cysts into five varieties (chylous, lymphatic, bloody, hydatid, and embryonal), with the 42 cases of embryonal cysts collected by Niosi, it follows that this last variety is not, as formerly thought, so exceptional, but rather occurs almost as often as the other varieties.

Etiology.—As to the causation of embryonal mesenteric

cysts, Niosi states that heredity plays no part in their development.

Sex.—Given in 39 of the 44 cases: 24 females and 15 males.

Age.—Given in 43, as follows: fœtus, 1; new-born, 1; under one year, 3; from one to ten years, 5; ten to twenty, 14; twenty to forty, 11; forty to fifty, 5; over fifty, 3. Moynihan cites three cases in which the ages were 73, 77, and 80 years.

Pathological Anatomy.—The cysts are usually round or spherical, but may be oval, pyriform, or club-shaped. In those that were pyriform or club-shaped there was a pedicle, which in the first case sprang from the vertebral column, and in the other inserted into the wall of the intestine. The size varies greatly, as from the wholly insignificant enterocystoma of Hueter, which was scarcely the size of a split pea, up to mine, which was as large as a man's head, or even the colossal cyst of Fehleisen, which contained 8.2 litres of fluid, and the cystoma of Nager, which was adherent to all the abdominal viscera. Moynihan cites Portal's case, which ended fatally by mere physical bulk of the cyst. The cyst wall varies in thickness from an almost transparent membrane to 1 cm., as in Niosi's case. Upon the surface at times run large vessels. In Dowd's case, a vessel the size of the femoral vein was present. Adhesions, particularly in large cysts, not infrequently involve the abdominal viscera (intestine, liver, spleen, pancreas, and bladder).

Intestinal disturbances caused by the cysts are often of more moment than adhesions. Sprengel notices invagination of the cæcum into the colon from a cyst scarcely 3 cm. in size. Eppinger observed volvulus; Bogers, volvulus with subsequent peritonitis; Fawcett, kinking; and Buchwald and Hediger, intestinal obstruction. Intestinal disturbances are severer the more intimately adherent cysts are to the intestines.

The position of a cyst in the mesentery is usually in relation with the terminal part of the ileum, at a varying distance from the ileocæcal valve. Less frequently, cysts are found in relation with the mesentery of the jejunum, cæcum, and mesocolon.

The contents of the cysts vary in color, consistency, specific gravity, and chemical constitution.

Symptomatology.—There are no definite symptoms peculiar to mesenteric cysts, as they do not cause pain nor any other subjective troubles; and they do not even engage the attention of their bearer until they have attained a certain size, or have caused acute intestinal obstruction. Moynihan emphasizes one symptom, namely, that of extremely rapid and serious wasting, probably due to interference with the lacteals.

Other symptoms described are a sensation of weight, nausea and vomiting, and constipation from pressure of the cyst upon the gut. So, too, colicky pains frequently arise from pressure upon the nerves, or from hindrance to the escape of fæces or of gas, or from adhesions. Such symptoms characteristic of no abdominal lesion, and common to many, are frequently attributed to "dyspepsia" or "indigestion," both by physician and by patient. This is but one of many maladies in which careful examination of the abdomen would, in all probability, clinch the diagnosis. On the other hand the omission of such a precaution may expose the patient to intestinal obstruction, which would lead to a sure, but by no means desirable, method of diagnosis.

Physical Signs.—Inspection is of value only for large cysts, in which case the tumor is usually most prominent near the navel.

Moynihan states that the most obvious and the most characteristic sign of the tumor is the mobility, transverse excursion being greater than vertical. This mobility is limited, if not entirely prevented, by adhesions. According to Niosi, the consistency is very elastic and fluctuation indistinct when the cyst wall is very thick, consists of several compartments (multilocular), or if the contents are inspissated, as in dermoid cysts. Confusion might arise between such fluctuation and the elasticity of a lipoma in the omentum or mesentery.

Percussion reveals an area of tympany around the tumor, and thus its independence of regional organs. If dulness should extend to the os pubis, by placing the patient in the

Trendelenburg position, the tumor, if a non-adherent mesenteric cyst, would gravitate towards the diaphragm, thus completing the ring of resonance. It is stated that, when the gut is empty, light percussion determines a band of tympany across the tumor, since the gut is interposed between the abdominal paries and the tumor.

Moynihan summarizes the most characteristic signs of a cyst thus:

1. Prominence of the fluctuating tumor towards the umbilicus.

2. Great mobility, especially in the transverse direction, and the possibility of rotation round a central axis.

3. The presence of a zone of resonance around and a belt of resonance across the cyst.

I believe that exploratory puncture is wholly unjustifiable here.

Differential Diagnosis.—Mesenteric are not commonly mistaken for ovarian cysts. In avoiding this error, it is helpful to ascertain if the tumor has grown from the abdomen towards the pelvis or *vice versa;* if an inferior zone of resonance can be obtained by the Trendelenburg position; and if both ovaries are independent of the tumor. Furthermore, there must be excluded hydronephrosis, omental, pancreatic, and renal cysts, cysts of the urachus, and lipoma of the mesentery. It is probable that, as in the past, most of these cysts will be diagnosed first on the operating table. Gas cysts of the intestine, of which Finney recently (*Jour. Am. Med. Assoc.*, Oct. 17, 1908, vol. li, pp. 1291–1297) collected 19 cases, might at first sight cause confusion at operation; but these, it seems, occur in clusters of very small cysts, which explode on pressure.

Prognosis.—The prognosis of mesenteric cysts conforms with that of abdominal lesions of similar magnitude. Uncomplicated cases, operated upon with good judgment, should recover, especially since infection is not concerned in the etiology of such tumors. In adhesions and intestinal obstruction, however, lurk dangers commensurate with the extent of the one and the duration of the other.

Treatment.—As soon as discovered, an intramesenteric cyst should be removed even in the absence of symptoms, and this, if for no other reason, as prophylactic against intestinal obstruction. It is known that chyle cysts frequently cause emaciation, and it is conceivable that operative delay here might dangerously impair the operative stamina of the patient. It is not absurd to refer to malignant degeneration in these cysts. Now and then a branchial cyst becomes malignant, so why not an intramesenteric? One well-known theory concerning the origin of malignant tumors puts the onus on misplaced embryonal tissue, and surely the tissue of some of these cysts is misplaced embryonal tissue. We shall watch further case reports for such a mishap.

There are four ways of dealing with intramesenteric cysts: (1) By aspiration; (2) by cystostomy and drainage, with or without the use of caustics; (3) by enucleation; (4) by resection of the involved intestinal segment. The first method (aspiration) was followed by recurrence in over fifty per cent. of cases, and is now obsolete. The second method (cystostomy and drainage), first employed by Sir Spencer Wells, is useful in the presence of numerous adhesions, to dissever which might impair the nutrition of the intestinal wall, or in an emergency. The third method (enucleation) is considered by many ideal, and is ideal when practicable. The fourth method (resection) I recommend in multiple, juxtaposed cysts, when it is deemed that too much surgical interference, as from dealing with the cysts one by one, carries more risk than simple resection.

ON "ESSENTIAL HÆMATURIA" AND "NEPHRALGIA."

WITH REMARKS ON THE TECHNIC OF NEPHROTOMY.*

BY ARNOLD SCHWYZER,

OF ST. PAUL, MINN.

THE group of cases called "essential hæmaturia," "nephralgia," and "hæmaturic colic" may be classed among the border-line problems between medicine and surgery. The name insinuates, in the adjective "essential," that we have no palpable anatomic or histologic findings. Later investigations have, however, shown that microscopic changes (often only minor) existed in some cases, and therefore also the synonym "pseudo-essential." For the sake of brevity I shall not consider the hæmaturia which occurs more or less periodically in children, where it was drawn into parallel with epistaxis, nor those cases due probably to some kinking in floating kidney, nor the hæmaturias in hydronephrosis or during pregnancy and lactation, nor the real hæmophilia cases.

I propose to give some personal observations where even etiological factors like these mentioned were missing. After such a kidney is split open in a case of severe repeated renal colic or long-lasting hæmaturia, and nothing is found on or in the kidney, its pelvis, and the ureter, a certain degree of uneasiness remains in the mind of the operator: "Have I not overlooked something?" We cannot examine the kidney in every corner; we may examine the fatty and fibrous capsule, split the kidney from pole to pole, examine its cut surface, feel its consistency, cut down into the pelvis, which should always be palpated first while the kidney is yet *in situ*, so as not to dislodge any possible stone in the manipulations necessary for bringing the kidney to the surface; we may inspect the pelvis, feel the calices and the papillæ protruding into them; we may

* Read before the Minnesota Academy of Medicine, December 2, 1908.

get a good view of a number of them, probe the ureter to the bladder—and all this was done in every one of my cases—but still we have not seen every corner and we may have overlooked this or that; be it a small concrement, be it a small tubercular ulceration on a papilla, be it a small neoplasm, or a tiny varicosity on a venule near a papilla. A general hemorrhagic diathesis we are of course supposed to have considered beforehand with the anamnesis.

By all means it is necessary that such cases be followed not only for some time but for a very long time after the operation, before we positively pronounce them or especially publish them as the one or the other. In this way cases of overlooked stones, tuberculosis, or neoplasms will be excluded with the greatest possible probability.

I intend to report in this paper five cases observed, now, from four and a half to six years after operation. The last two of these cases I have mainly added for comparison of the microscopic changes in the kidneys, as in one the symptoms were perhaps and in the other with certainty due to a ureteral stone. From all these kidneys I have microscopic sections which were obtained by removing a piece 4 to 5 millimetres thick, and about the surface of a thumb-nail. The specimens were not handled in any way but dropped into alcohol from the knife blade that removed them. The sections were taken from the interior of the removed pieces, so as not to have any admixture of blood.

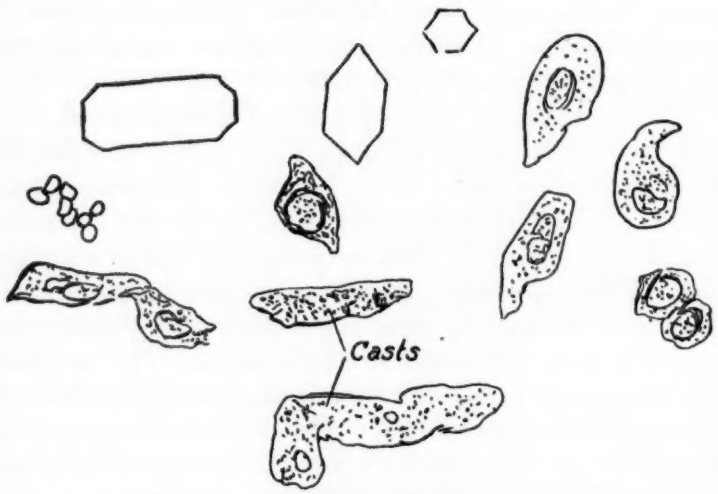
CASE I.—Mr. A. R., of Winona, 40 years of age, of robust build, very moderate in his habits, working in a factory, came to me on September 1, 1902. He gave the following history: He had typhoid fever when five years old: was never sick since with exception of the grippe, which he had about ten years ago, and some rheumatism with fever five years ago. He is working in a fibre factory. No aniline (known to produce bladder cancers) is used, but other chemicals, which he cannot exactly describe.

About three weeks ago he noticed for the first time blood in his urine, which was quite profuse. He had no pains to speak

of. Six or eight weeks ago he hurt his back by lifting a log; this is all that he could accuse. A few days ago he had a little queer sensation above McBurney's point; he would, however, hardly call it a pain.

I examined the patient in my office and find the following notes: Everything normal with exception of the urine, which contains small quantities of blood and apparently hardly more albumin than due to the blood. Bladder (per rectum and with sound) appears normal. The lower pole of the right kidney is a little sensitive on palpation; nothing abnormal, however, to be felt.

FIG. 1.



CASE. I. Second urination after the nephrotomy. Urinary sediment.

As the bleeding remained quite constant notwithstanding feeding on gelatin, etc., and, before all, as the bleeding became more marked notwithstanding rest in bed for two weeks, I decided to explore the kidney, after the blood had been found to come from the right side only, and this with Harris's segregator at two examinations two days apart.

At both times it appeared that the right side was more abundantly secreting than the left one, as 3:2. The urine from the left kidney showed a trace of albumin, and was 1019 sp. gr. The urine from the right side was also 1019 sp. gr.

On September 16 I laid the kidney bare and brought it to the

surface after removing a part of the twelfth rib. The kidney was somewhat enlarged, its consistency seemed about normal. Freeing the kidney out of its bed was not abnormally difficult. Digital compression of the renal artery. Incision from pole to pole according to Zondek about 8 mm. behind the largest convexity. The poles were not entirely split. Pelvis opened, explored, and sounded. No changes found. The kidney substance appeared normal. Excision of a piece for microscopic examination. Suture of the kidney with six or seven deep catgut sutures, running from the surface to the medulla. About three superficial catgut sutures where it bled. Gauze strip down to the kidney after its reposition. Closure of the wound up to this drainage strip. Anæsthesia, as in all other cases: ether with a previous hypodermic of morphine ¼ gr. and atropine $^1/_{100}$ gr. Patient stood the operation very well. After three days gauze drain removed, no urine was noticed to come from the wound. The urine had been very bloody after the operation and microscopically had shown large quantities of blood-corpuscles, kidney cells and some tube casts (see Fig. 1). On September 20 (four days after the operation) the urine was, however, beautifully clear, had no reddish tinge, but showed a trace of albumin. Specific gravity 1016. The patient declares that the urine was at no time as clear as this since the first beginning of his trouble. He left the hospital for his home fourteen days after the operation. The patient remained perfectly well, is now (October, 1908) looking very vigorous, and the urine, which is free from albumin and sugar, has a specific gravity of 1024 and has remained entirely clear up to now—six years after the operation.

CASE II.—Mr. A. F., of Havre, Montana, 36 years old, of robust appearance, very moderate in all his habits, railroad office employee, came to me on November 9, 1902.

The intelligent and well educated patient had observed himself very carefully. While there was nothing in his previous history which could have any bearing on his kidney trouble, he woke up one morning in May, 1902, with a dull pain in the region of his right kidney, which became excruciating. There was also an irritation to urinate. The pains lasted thirty-six to forty hours with intermission of one or two hours. The second day the pains grew weaker and rarer. There occurred, however about one and a half to two hours apart, two attacks, which lasted forty to sixty

minutes as an excruciating, steady pain. The pain started directly over the crista ilii just outside the erector spinæ. Shortly before these and also before the later attacks of pains the patient always had a bad sensation in his mouth, as though from a spoiled egg. This sensation lasted about one minute and then the pains would start. After the pain in the kidney has lasted ten to fifteen seconds, it travels along the course of the ureter down to about McBurney's point. It takes about ten to fifteen seconds to travel down to this point, and then it usually remains here the same length of time. After this it goes slowly farther down, and this is accompanied by a decrease of the pains. When it then reaches the linea innominata, relief comes; but a burning in the bladder persists for some time. Patient usually had no pains in the night, but only after he got up in the morning. *The first attack came on after a sharp ten hours' ride on horseback.*

On September 20, 1902, a second attack occurred after jumping down from a platform. This attack lasted four hours and consisted of about three separate spells. It passed over without morphine, which had been necessary at the attack in May. After this attack there remained for several days a sensation of pressure as though from outside against the loins. Immediately before the attack he had felt languid, but had an unusual appetite.

The urine at these attacks was brown, turbid, thick, like turbid weak coffee. On the 16th of October he wrote me these data and added that he did not feel well at all. He suffered the last few days continually from dull pains in the kidneys and from a very disagreeable sleepiness and dizziness. He then used for several days rest in bed, milk diet with some bread, and much distilled water. Soon after the patient had again the premonitory bad taste in his mouth, which comes on suddenly, and is always accompanied by a brown urine. This sensation appeared fifteen to twenty times a day for about two weeks up to the time of my first examination.

The examination of the patient on November 9, 1902, gave healthy conditions with exception of the right kidney, which was sensitive on pressure, and the findings in the urine. The kidney could not be palpated in the rather fleshy robust man. Segregation of the urine with Harris's instrument on November 10. From the left side we had a clear, straw-colored urine, slightly alkaline in reaction, 1018 sp. gr., with no trace of albumin. On

the right side the urine was turbid, alkaline, 1019 sp. gr., containing a very small quantity of albumin. During the time that 100 drops were counted coming from the left side, there came only 67 from the right one.

The turbidity of the urine of the right side was due to red blood-corpuscles and to a great many epithelia. It is probable that at least part of the blood came principally from a slight injury by the segregator to the bladder mucosa, a fine fresh coagulum being found on the catheter when removing the instrument.

Operation on November 12, 1902. As the ribs came very far down and as the kidney appeared therefore far up under the border, I removed a good portion of the twelfth rib. It then happened, after the rib was away, that in further freeing the parts a tear of about 3 cm. occurred into the pleura, promptly followed by a noise produced by the sudden entrance of air. The opening was at once closed by compression. The patient, who was never kept very deeply under the influence of the anæsthetic, felt probably some pain from squeezing his pleura so firmly and began to moan and press. Of this we made use by allowing some air to escape during the moments of forcible pressing of the patient, and I am sure it did good service. A continuous catgut suture closed the opening firmly. There arose, as you would expect, no trouble afterward from this opening of the pleura.

It was more difficult than usually to free the fatty capsule away from the kidney on account of many fibrous bands, which, though fine, were quite firm. Nevertheless all the freeing could be done by the hand and fingers without a cutting instrument. Palpation of the pelvis and of the kidney gave a negative result. The organ was then brought up upon the body surface. Digital compression of the renal artery. The kidney was incised as in the former case; nothing was found. The pelvis was probed in every direction and a ureteral catheter was introduced. A small piece was removed for microscopic examination and then the kidney was sewed up entirely with six figure "8" catgut sutures. The deep loop of these sutures included the larger vessels at the junction of cortex and medulla (arteriæ et venæ arciformes). Besides this two or three simple superficial sutures. A small gauze drain was introduced to the replaced kidney and the rest of the wound closed.

There was at no time urine noticed in the dressings. No hard

pains followed the operation. The urine contained great quantities of blood at first after the operation, but cleared up after a few days. Three weeks after the operation the patient came to my office, feeling quite well. The urine was entirely clear. There was only a very small trace of albumin in the morning urine, while the urine passed during the day did not contain any with the nitric acid or the Esbach tests. The abnormal sensation of taste never occurred after the operation.

On December 12, 1904—two years after the operation—I made the following notes: Urine entirely clear; no trace of albumin; specific gravity 1018. Patient is the picture of health. He says he feels very well and never had the slightest trouble since he left the hospital. This result has remained the same up to August, 1908, when I last heard from him.

Case III.—Mr. O. S. Sh., of Wells, Minn., farmer, 32 years of age, of temperate habits, tall, of good physique, came to me on January 3, 1903. He had always been well up to November 20, 1902, when he noticed a very bloody urine, though he had no pains. This condition remained quite constant up to the time of my examination (a little over six weeks in all), with exception of three free intervals of about twenty-four hours each. He was under careful medical attention; never had any pains. Appearance of all organs normal. Kidney was not sensitive, nor to be outlined distinctly. However, urine dark, bloody. Bladder normal. Harris's segregator gave entirely clear urine from the left kidney with only a small trace of albumin.

The right kidney gave the same quantity of urine as the left, but the urine from the right side was very bloody. It did not contain more albumin than in my estimation corresponding with the blood, 1¼ per thousand with the Esbach test. Microscopically nothing but blood-cells.

On January 7, 1903, incision into the kidney. Opening of the pelvis in the upper and lower main spaces. Papillæ as completely as possible explored. Nothing abnormal. The cortex appeared somewhat large; its color about normal. Excision of a piece and complete closure of the kidney wound with four figure "8" and two simple superficial catgut sutures.

The striking feature in this case was that from the adipose capsule, which was rather poorer in fat than normally, there were numerous strong bands running from all sides toward the fibrous

capsula propria. These bands were so firm that I had used them to dislocate the kidney upon the surface. These adhesions were found at all parts of the surface of the kidney and were quite solid; though only fine lamellæ, some had to be cut with the scissors.

Mr. Sh. continued to pass very bloody urine for about one week; then the quantities of blood became more moderate though yet quite considerable. There had at no time been urine in the dressings in a noticeable quantity. Patient left the hospital on January 17, ten days after the operation. Continuance of the bleeding after the operation had made me think that perhaps the other kidney was now bleeding. An examination with Harris's segregator, however, showed the blood to come—as before—from the right side. On February 16 the patient wrote me that he felt as strong as ever. In a sample of his quite bloody urine we found kidney-cells besides the blood, no casts. Probably as much blood as before the operation. The patient writes, however, that, while he had passed some clots of blood before the operation, he did not pass any since coming home.

The result in this case up to that time was very small, with the exception that we knew that there existed with all reasonable probability no condition which was neglected by waiting. Stone, neoplasm, or a recognizable degree of tuberculosis was excluded. This in itself is an important gain in such a case. So we waited. The blood very gradually decreased in the course of one year, until the urine was finally free from blood by January, 1904.

In September, 1908, I heard from him upon writing him. He is apparently quite well and free from any symptoms of kidney trouble.

The next case doubtful in our mind at the time of the operation proved to be one of an overlooked ureteral stone, but I will mention it here in full, because the comparison of the clinical history and of the macroscopic and microscopic changes in the kidney is of importance for some points which I want to emphasize.

Case IV.—Mr. F. B., railroad engineer, 35 years of age, very robust, of strict habits, was kindly referred to me by Dr. Eshelby of St. Paul, on January 29, 1903.

Mr. B. had never been seriously sick up to eight weeks before that date, when, while oiling his engine just before starting for his daily trip, he noticed a sudden dull pain in the right iliac region. He nevertheless tried to run his engine, but in twenty minutes the pains had become so excruciating that he had to give up. Morphine then eased the pains and for two or three days a very marked soreness persisted. From the anterior part of the crista ilii the pain went toward the lower inguinal region. There were never any pains toward the testicle or bladder at that time. Dr. Eshelby found microscopically some blood in the urine at the time of the attack, but no casts. After the mentioned two or three days of very marked soreness were over, there remained a pain of moderate intensity for two weeks over the right kidney. Another severe attack of pain occurred about a month later and a third one on the day previous to my examination, after his urine had been very dark and bloody for one week.

In all three attacks the patient vomited frequently. At the second attack the pains had gone toward the testicle. At no attack was there tendency to frequent urination.

The examination revealed besides quite normal other organs a sharp pain in the back and in the testicle on the right side. Objectively nothing was to be made out on the fleshy and very strong man. The urine was very bloody, almost black, turbid. Microscopically nothing but blood.

On February 3 we operated upon the man, though the urine had materially cleared up the day before. Kidney exposed and opened as in the other cases. The fatty capsule was very bulky. The kidney was abnormally large, the largest of these four cases; of normal consistency, lobulated. Palpation of the pelvis *in situ* negative. Incision of kidney. Pelvis explored and ureter sounded with a spiral metal probe, which did not encounter any resistance, though it gave once a peculiar sensation, when introduced low down into the ureter. This was, however, unfortunately judged not to come from any solid mass. The conic-shaped cut surface belonging to *two lobules in the middle portion of the kidney* were from the cortex to the papillæ *much darker than the rest of the kidney* and appeared hemorrhagically infarcted. The dark color remained notwithstanding the free incision through these parts. The rest of the kidney looked normal. The pelvis was inspected and all its parts exactly explored. While all the papillæ appeared

normal, the *mucosa of the pelvis showed rather numerous minute hemorrhagic spots.*

Excision of a piece partly through the dark area. Kidney united with six interrupted figure "8" catgut sutures. The rubber tube was then removed; no bleeding. No urine noticed in the dressings at any time.

The patient was allowed to be out of bed ten days after the operation. His urine, which it must be remembered had started to clear up the day before the operation, was again quite clear after four days. The patient felt excellent and left the hospital thirteen days after the operation. On that day he stated that ever since the first attack there was even at the best of times some soreness in the right side, but that now he felt entirely well. This I only mention to show the fallacy of too early reports of such cases.

To make the story short; good times and attacks of pains then changed off; at times the free intervals lasted several months, in which he was as well as he could wish to be. After repeated attacks a stone was passed on October 6, 1905, and with this all the symptoms ceased. He remained well up to my last interview on October 1, 1908. The urine was clear, 1020 sp. gr., free from albumin.

The fifth and last case to be reported is one of a rather profuse bleeding following—as it seemed probable to us—the passing of a stone from the ureter into the bladder a few days previous to my first examination.

CASE V.—Mr. G. H. W., 27 years old, railroad man, was seen by me on March 21, 1904, in consultation with Dr. Geer. While the patient claimed never to have been sick before, the present trouble started in November, 1903, with a very severe colicky attack of pain under the right ribs. He vomited after morphine. First he had the sensation that the urine wanted to come, after this the bowels wanted to move, and then the strong pain appeared. It lasted about two days and after that there remained a slight soreness. He was five days in bed. The second attack of again very severe pain occurred on February 20, 1904, and lasted twenty hours. Third attack, the severest of all, was on February 25. The pain was for three days atrocious. Then something seemed to slip into the head of the penis, which made him yell

from pain. This happened while he was lying on his back quietly and not, as one might think, while urinating. After this the pain ceased. He was not aware of having since then passed a stone in urinating. The urine contained blood, which remained very abundant after the pain had ceased. This was the reason that on March 2 I laid the right kidney bare. It was congested and about one-half larger than normal. Its fatty capsule was dense and adherent, so that in freeing the kidney from its fat a part of the fibrous capsule of the kidney was stripped off. Kidney split longitudinally down to pelvis. Ureter catheterized. No stone to be found. The parenchyma appeared fairly normal except for the congestion. A deep layer of catgut sutures to secure the larger vessels and a superficial one. Fearing some strangulation of the kidney parenchyma after the suturing, the fibrous capsule was split on the anterior and posterior surface. Nine days after the operation there were only a few blood-cells to be found in the urine. The patient left the hospital two weeks after the operation and came to my office another week later (March 23) feeling fine. One year after the operation the urine was normal and the patient felt well. Dr. Geer had the courtesy to examine the patient for me in September, 1908, and reported him as well. His urine was free from albumin; 1018 sp. gr. He had at no time had any signs of his former trouble.

Histology of the Five Pieces Removed from These Kidneys.—The specimens were all stained with hæmatoxylin and eosin or Van Giesen's stain.

Case I.—This case had simple renal hæmaturia of five and a half weeks' duration and no pains except slight ones on palpation of the kidney.

The majority of the *glomeruli* show in their capsules some granular masses, which often fill large spaces between the glomerulus and its capsule, and form crescent-shaped granular areas with here and there a recognizable red blood-corpuscle or some detached and disintegrated epithelial cell in them. These epithelial cells, though not very numerous and very rarely as many as eight or ten in a section of a glomerulus, are distinct. They seem to come from the glomerular epithelium, as the capsule with its flat, sharply-stained cells looks quite normal, while in some few places (though not very commonly) the superficial glomerular capillaries are poor in nuclei and appear like hyaline tubes with only comparatively few (endothelial) nuclei. The detached cell-bodies, which only take a diffuse stain, and which sometimes are ready to change into granular heaps, are therefore in my estimation *desquamated glomerular epithelia.*

FIG. 2.

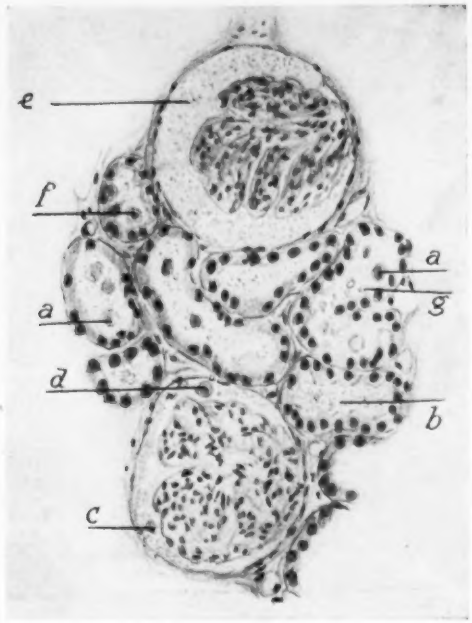


FIG. 3.

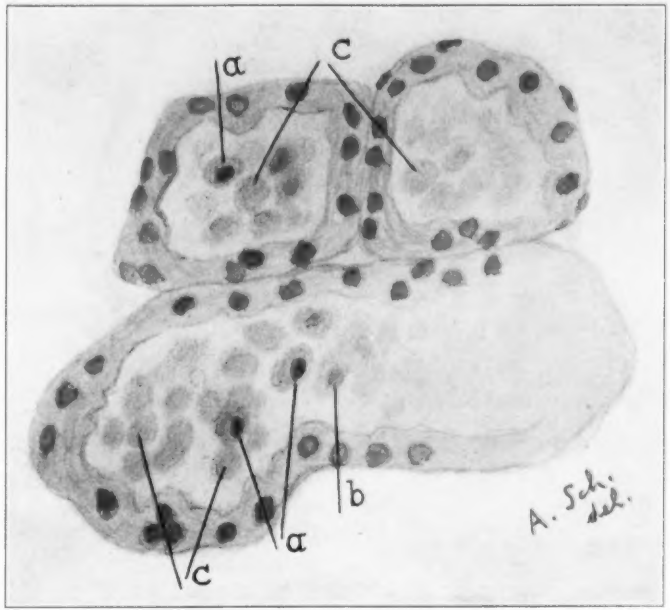


FIG. 2. CASE II.—*a*, disintegrated epithelial cells in convoluted tubules; *b*, amorphous detritus in convoluted tubules; *c*, red blood-corpuscle in Bowman's capsule, which is, however, a rare appearance; *d*, disintegrated epithelial cells (glomerulus-epithelia) in Bowman's capsule (these cells are in other places more numerous, 5 or 6 in one spot); *e*, amorphous detritus or precipitate in Bowman's capsule, in many places taking up considerable room; *f*, detached fresh epithelial cell in a convoluted tubule; *g*, red blood-corpuscles in convoluted tubules.

FIG. 3. CASE II.—Convoluted tubules with a flattened, sharply outlined epithelium and well staining nuclei. The protoplasm is finely granular, does not show any fatty degeneration. In the lumen there are large quantities of cellular bodies in different degrees of disintegration: *a*, with well stained nucleus; *b*, unstained but recognizable nucleus; *c*, nucleus gone. (The reproduction of the original drawing is not very good.) The tubules, as seen here, are *typical for the whole section;* in some places they contain fresh blood-corpuscles; that is, however, rather rare. The glomeruli contain sometimes granular detritus and a few epithelial cells in the capsule, others are quite normal. The large majority of the convoluted tubules show, however, cellular masses, distinctly desquamated epithelium. They appear distended by these contents. Capillaries in many places distended, in others normal. Capillaries in glomeruli often distended with blood.

FIG. 4.

FIG. 5.

FIG. 4. CASE II.—The convoluted tubules are filled with disintegrated epithelial cells, which are packed together and form cast-like solid masses, while the epithelium is stretched and lowered, with nuclei all well stained and the protoplasm sharply outlined, well stained with eosin, showing no fatty degeneration. The distances between the nuclei are great, showing the stretching of the wall of the tubules. No interstitial changes. In some places the blood-vessels (capillaries) are distended with blood to their maximum, in other places without changes. The capillaries of the glomeruli are mostly distended with blood to an abnormal degree; in some places there are no signs of any anomaly. In the hyperæmic glomeruli there are (though few in comparison with the convoluted tubules) detached fresh and disintegrated epithelia and granular masses. Henle's loops also contain granular masses in many places.

FIG. 5. CASE III.—Simple painless hæmaturia. The convoluted tubules contain a very moderate amount of epithelial cells, but much blood and blood detritus, though hardly to be seen in this section (Glomeruli normal in this case. Much blood in Henle's loops and the straight tubules.)

FIG. 6.

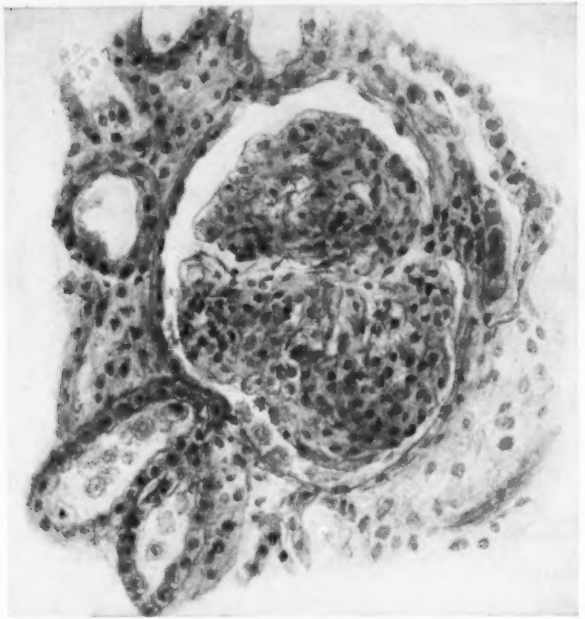


FIG. 7.

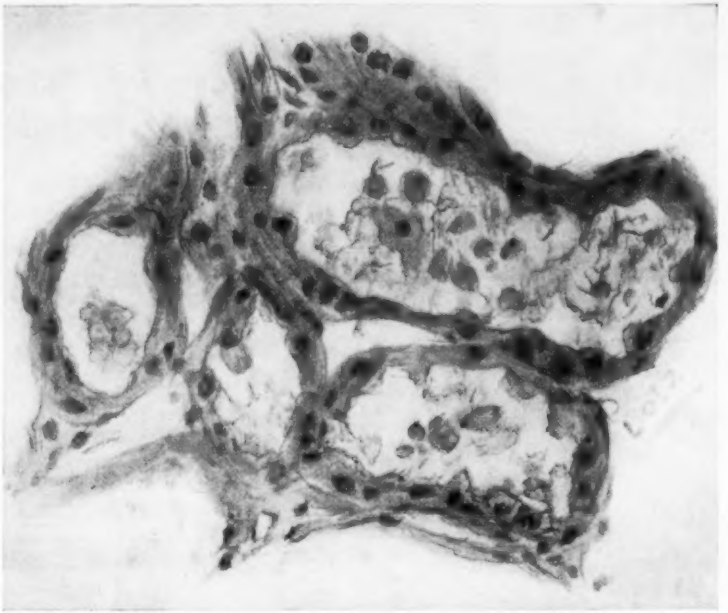
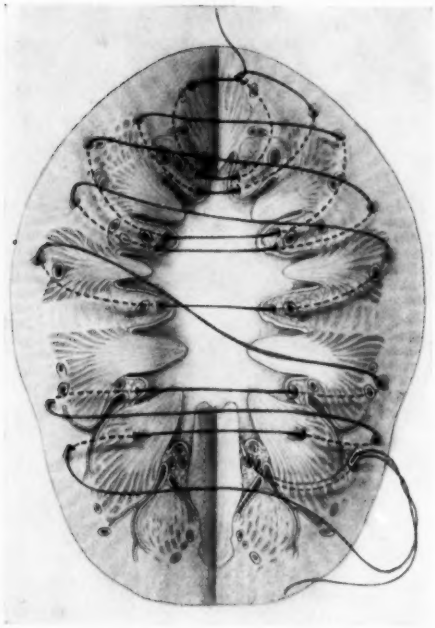


FIG. 6. CASE IV.—Ureteral stone colic. In the glomerulus there are several granular detached epithelial cells with nuclei unstained or only slightly taking the stain. Glomerular capsule normal. (In some other glomeruli red blood-corpuscles were found and amorphous granular deposits.) Proximal convoluted tubules containing desquamated epithelia and granular débris. Interstitial tissue normal.

FIG. 7. CASE V.—Profuse hæmaturia (probably following a ureteral obstruction which was suddenly spontaneously relieved). Convoluted tubules distended, epithelium stretched and flattened. They contain fibrin threads, blood-corpuscles, and detached epithelial cells whose nuclei do not take the stain any more. Interstitial tissue normal.

FIG. 8.



Catgut suturing of the kidney, grasping the large blood-vessels of the areolar tissue between each two papillæ (branches of the arteriæ interlobares) and also the arteriæ arciformes, found between medulla and cortex. Because the bleeding into the pelvis is the most important, as it distends the kidney and loosens the sutures, in a severe case of hemorrhage the layer nearest the calices might preferably be first sutured separately and firmly.

The *convoluted tubules* show almost uniformly an abnormal content, though the quantity varies. You see detached, easily recognizable, very granular epithelial cells in different stages of preservation from the few freshly detached cells with a well stained nucleus of the shape, size, and staining qualities of the lining cells of these tubules, down to the much more common forms of dilapidated cell-bodies ready to fall into granular *débris.* In some places as a stage of transition you can recognize a nucleus by its form, but it is unstained. The remainder of the lumen of the tubules is more or less filled with amorphous granula. How much they represent disintegrated blood is not to be made out in these specimens. The lining of the tubules is well stained; there is no fatty degeneration. The cell protoplasm takes a rather uniform good eosin stain. In some places the tubules are free from abnormal contents; their high epithelium with the conic free ends is beautiful. In some convoluted tubules there are red blood-corpuscles, but never in larger masses.

Henle's loops and the tubuli recti give normal pictures; here and there we find some little granular or bloody content in their lumen, but comparatively very little. *The interstitial tissue* in general is normal. Between the tubules the stroma is very small and tender. In no place are there indurative or sclerotic changes. There is no increase in nuclei anywhere in the large section except, however, *in one place,* where there is a rather dense *infiltration of round cells* over an area a little larger than the size of a glomerulus. An obliterated glomerulus is at the side of this. In a few places there are hemorrhages into the interstitial tissue. The contours of these extravasations are shaped according to the adjoining tubules. In one place there is an adjoining convoluted tubule, whose nuclei and protoplasm have taken a deep eosin stain and into whose lumen extravasated blood appears to be continuing.

The *blood-vessels* do not show any anomalies. In looking back over the case we are struck by the absence of *diffuse* interstitial inflammatory changes, notwithstanding the alterations in the epithelium, consisting of a desquamative process mainly in the convoluted tubules and also in the glomeruli, together with bleeding into the latter. One might be tempted to speak of a diffuse nephritic process, say a very mild degree of it; nevertheless outspoken inflammatory signs are missing, and the complete cessation of all the clinical symptoms, including the absolutely normal condition of the urine six years later, gives it a character different from what we commonly consider under nephritis. The area of leucocyte infiltration and the obliterated glomerulus, it is true, may indicate a minute embolic infective condition and the fibrous perinephritis could be thought to be the consequence of this.

CASE II.—This case had severe renal colics at long intervals and turbid, coffee-like urine at the time of the operation.

The *glomeruli* are as a rule normal in appearance, except that a number of them have a granular deposit along the capsule, though never as marked as in the former case. No recognizable detached cells or blood-corpuscles within the capsules. As a whole the glomeruli are rather free from changes.

The proximal *convoluted tubules* show a marked distention; their lumina are comparatively wide, the nuclei of the epithelia are farther apart than normally, and the cell protoplasm, which is well and somewhat uniformly stained with eosin, is low. There are only a few convoluted tubules which are not containing desquamated cells. These tubules are smaller and have an epithelium of the normal high, conic shape. They are probably distal convoluted tubules. As only very rarely there is anything abnormal to be seen in a *Henle's loop*, it speaks for a retention of these cellular masses in the convoluted tubules, where the desquamation must have occurred in the main. All transitions in the desquamated cells are to be noticed: a few freshly detached cells with good nuclear stain and of the character of the lining of the convoluted tubules; then very large quantities of disintegrated cells partly with a sharp outline, partly forming only a coherent granular mass. As Fig. 3 shows, this cell detritus is in some places so tightly packed that it is formed into a more or less uniform-looking compact granular mass.

The *blood-vessels* and the *interstitial tissue* appear entirely normal.

Looking at Case II now after nearly six years of perfect freedom from pain and urinary or any other symptoms, we get much more of a bird's eye view of the whole, if I may say so. A congestion of the kidney, peracute after the ten hours' ride, seems to have been the cause; or, perhaps better, one of the causative factors for the first attack, and this first attack may have left a vulnerability of the kidney which caused the second attack after a mere jump from a platform. That a nervous element may have been added to the case is probable, if we remember the abnormal gustatory symptoms, which preceded every attack with greatest regularity. We know that the kidney function is under very powerful control of the nervous system, so much so that, for instance—as you all know—traumatism to one kidney can completely inhibit the function of the other. I might add to the history of the case that our patient had been pathologically nervous a few years previous to the kidney affection. Perhaps the trauma was the main cause, a mild fibrous perinephritis added its share, and a prolonged retention of desquamated material afterward might have left a tendency to further attacks of undue congestion.

Case III.—This was characterized by constant and profuse renal hæmaturia for about seven weeks, not to be influenced in any way by medical

treatment and care, with no pains of any kind. The firm adhesive bands around the kidney ought to be remembered.

The striking feature of the microscopic picture and the marked difference from the other cases is the large quantity of blood and blood detritus in the *convoluted tubules.* There is only a slight desquamation of epithelial cells. We see large quantities of blood in *Henle's loops,* and the straight tubules with enlarged blood-vessels between them. These pictures explain the origin of the blood in the urine. The *glomeruli* appear normal. The convoluted tubules besides their bloody contents are otherwise normal. There are no casts. Besides the mentioned hyperæmic blood-vessels there are no changes in the interstitial tissue, no infiltration, no thickening, no exudates.

We have here a mild old perinephritic process forming band-shaped adhesions, and we have very little more than a hyperæmic kidney, with extravasation of blood into the tubules. Nephrotomy revealed nothing further. The history of the case gave no clue either. The only factor remaining was that we had to do with a robust man of a hard-working class. Did the perinephritis, the very cold winter weather, and hard work combine their effects to bring on this condition? For a correct sizing up of the case it is necessary to be able to exclude other causes by a long observation after the operation. The patient remained well for now nearly six years with no signs of a nephritis, or of stone, of tuberculosis, or tumor, or any other abnormal condition.

CASE IV.—This case had severe colics due to a ureteral stone, and very bloody urine up to the day before the operation.

Glomeruli.—In some we found a number of granular, detached, disintegrated epithelial cells, while the capsule was quite normal and also its flat epithelium. Besides this we had in some glomeruli red blood-corpuscles, and some amorphous granular deposits. These changes are, however, little marked; the majority of the glomeruli appear normal, and where these abnormal capsular contents exist, they do not take up nearly as much space as for instance in Case I. I found *two obliterated glomeruli.*

The *tubuli contorti* contain desquamated epithelia and granular masses, mostly found loosely spread in the tubules. Sometimes, however rarely, these granular *débris* show their origin from epithelial cells, being grouped into well outlined masses of the size and shape of the epithelial cells; or they form a more solid mass in the tubules, though one could hardly call it a coherent cast. Among this amorphous material there are recognizable red blood-cells, which make it probable that a great part of the detritus is also of hemorrhagic origin. In some tubules blood is found in larger quantities.

Henle's loops and the straight tubules appear normal. The *interstitial tissue* is also quite normal, with the exception of one focus of marked leucocyte infiltration. It has the size of about two glomeruli. No hemorrhages into the tissues. It is of interest that after the stone was passed many months later, the urine remained clear. At the last examination, in October, 1908 (five years and nine months after the operation), it contained no trace of albumin and had a specific gravity of 1020.

Is it not interesting to find in this case of a stone the very identical changes in the parenchyma as in the former "essential" forms? Does it not lead one to feel that the desquamation is mainly the ***result*** of a retention or congestion? In examining my cases over again I could not refrain from the thought that perhaps some of the reported "essential" cases, declared later on to be microscopically glomerulonephritis, were nothing else than pictures as we saw them, perhaps some of them more outspoken. Then a number of these somewhat magic cases of mild and even chronic "nephritis" with their very severe colics would have to be looked at in another light; the changes found by the microscope would then not be cause but consequence, and the *primum movens* would be a congestion or stasis (active or passive hyperæmia) of different origin.

Another point is brought out by this case. This specimen shows us the kidney as it looks during an attack of ureteral stone colic. The blood does not come from an abrasion as one might perhaps think, nor does it mainly come from the mucosa of an overdistended pelvis; but it comes to the greatest extent *diffusely from the kidney parenchyma, the tubuli, and even the glomeruli,* and following this thread further it is now nothing miraculous that in a case of ureteral difficulty we should find an obliterated glomerulus or a few small foci of leucocytes. This is the way we finally—far in end—come to the cirrhosed, fibrous, stone kidney.

Then, in some of the reported nephritic "pseudo-essential" cases, should not the disseminated alterations in the parenchyma or stroma be due to an overlooked ureteral difficulty?

How easily such a condition could escape the observer, I think is shown by the next case, where the exploration was entirely negative, though the history of the case made it prob-

able that a ureteral stone (or perhaps a blood coagulum?) produced the colic.

CASE V.—Operated upon probably a few days after a ureteral stone had slipped into the bladder. The microscopic examination of the small piece removed shows the *glomeruli* proper and their capsules to be normal in structure. In the capsular spaces are frequently seen blood-corpuscles and masses of fibrin, adherent partly to the capsule, partly to the capillary loops. In some glomeruli the blood clots are bulky, in others we see only traces of blood and fibrin. Hardly any desquamation. *Convoluted tubules* distended; epithelium flat, as if drawn out. Almost all the convoluted tubules are filled with fibrin, blood, and desquamated epithelia that have lost the nuclear stain. These latter seem packed into casts in places. *Henle's loops* partly contain fibrin and at times show irregular arrangement of the epithelial lining, pointing toward some desquamation. *Tubuli recti* partly containing fibrin. *Interstitial tissue* normal; no infiltration or thickening.

In summing up the findings in our cases briefly, we see that, macroscopically, there were strong perinephritic bands in Case III, with his seven weeks' painless hæmaturia, and the same, though not quite to such an extent, in Case II, with the renal colic. In Case IV, of ureteral stone, we found an infarcted area comprising two lobules and we also had numerous minute hemorrhages in the mucosa of the kidney pelvis. Otherwise all the five kidneys appeared normal, except that they were more or less enlarged.

Microscopically, the most striking thing was the *lack of any diffuse changes in the interstitial tissue.* The *glomeruli* show more or less extravasated blood in the capsular spaces and some desquamation of glomerular epithelia. In Case III (simple hæmaturia) this was even lacking. No glomerulonephritis, no thickening of Bowman's capsule. The main changes in all the five cases are found in the *tubuli contorti.* They are for the greatest part filled and distended with large quantities of desquamated epithelial cells and blood. As to the origin of these mostly dilapidated cells, I could not decide whether they were mostly or even partly from the glomeruli. The convoluted tubules did not show any defects in the epithelial lining. These masses are apparently dammed up here. The *loops of Henle* and the *straight tubules* have a normal

appearance except in Cases III and V, where some of these tubules contain blood. Both these cases were operated upon during profuse bleeding.

In comparing the last two cases with the first three, we have in all of them *diffuse bleeding* into the parenchyma in nearly all parts of the microscopic sections. This is the same in Case IV (stone) and in Case V (supposed stone) as in the other "essential" forms. In all the five cases we further have a marked filling of the convoluted tubules with desquamated epithelial cells. This indicates that this desquamation was a consequence rather than the cause of the colics or of the hæmaturia, and is most probably due to congestion and distention in the kidney. It is not of an infectious or a toxic origin, and thus we can understand the apparent incongruence between the dangerous-looking urinary sediment and the pronounced abnormal findings in the microscopic kidney sections on the one hand, and on the other the small quantity of albumin in the urine and the thorough final clearing up of the cases clinically.

In two of our cases we ran across an occasional obliterated glomerulus. Each of these cases also presented a small focus of infiltration. Case IV was the patient in whom a ureteral stone was with certainty the cause of the kidney changes, and it is in this one that we found the two obliterated glomeruli and the leucocyte focus, which was the size of two glomeruli; while in Case I (painless hæmaturia) we found one obliterated glomerulus and a leucocyte focus of the size of one glomerulus only. The stone case therefore presented the same changes in even a larger degree.

It was a clear aseptic—as far as this goes—ureteral calculus case with obstruction to the urine and overdistention of the kidney and its pelvis. Still we had this focus of leucocyte infiltration. As the kidney is a filter for bacteria (many kinds being expelled with the urine without producing changes in the kidney), it is not difficult to imagine that a pressure in the organ great enough to produce multiple minute hemorrhages in the pelvic mucosa could give rise to some small localized inflammatory foci in the presence of so much microbic material.

Coming back to Case I, of painless hæmaturia, where we also found an obliterated glomerulus and a small area of round-cell infiltration, this may or may not be due to an embolic infective process as pointed out above; it could also be a local inflammatory focus as the *result* of an overcongestion of the kidney.

NOTE.—Suppose that a sudden congestion—be it by obstruction of the ureter or otherwise—can produce such desquamation of cells in the tubules of the kidney and can produce minor infiammatory changes;[1] then a moderate fibrous perinephritis, as often found in these cases, can very well be a further consequence of mild inflammatory foci directly due to injury of the kidney by overdistention; in other words, even the perinephritis could be considered as a result instead of cause. Once established, a perinephritis may be a predisposing factor for further irritation and attacks of congestion by hampering the kidney in evading traumatism.

In other cases a fibrous perinephritis may be secondary to an appendicitis, which latter could even remain unnoticed. The lodge of the right kidney is outlined by a delicate fascia outside of the adipose capsule. The fascia is closed in every direction except downward, where it is widely open and allows free entrance of infectious material from the retrocæcal areolar tissue. In one of the cases of hæmaturia due to acute appendicitis, which Seelig reports in the September number of the ANNALS OF SURGERY, 1908, the infection was found to continue from the appendix through the areolar retrocolic tissue to the kidney lodge. While in this case we have a hæmaturia due to direct continuation of the infection, in other cases of hæmaturia due to acute appendicitis a moderate infectious embolic or toxic condition must be considered. (I have just now a girl of eleven years under observation, where a physician had made the diagnosis of nephritis on account of albumin in the urine, which disappeared, however, promptly after the removal of a subchronically inflamed appendix.)

What an appendicitis can do in this way, other infectious conditions in the body may also produce, and thus we have a pointer for the examination of hæmaturic patients.

Upon a severe congestion the glomeruli seem to answer mainly with hemorrhage, and the convoluted tubules with extensive desquamation. Part of the bulky desquamated

[1] Sampson (Johns Hopkins Bulletin, Dec., 1903) observed on dogs that staphylococcus cultures injected into the jugular vein only caused infection of the kidney when its ureter had been tied, while otherwise bacteria were to some extent eliminated with the urine. The mildest degrees of infection, however, as we suppose them for our cases, would hardly be looked for in such experiments.

masses may well come from the glomerular and capsular epithelia. The whole, being packed together with more or less blood, would be dammed back in the convoluted tubules in front of the tiny Henle loops.

When once the desquamation has started, it is reasonable to think that the retention of a portion of this material increases the swelling of the kidney, and that this makes the perhaps more transitory congestion have a longer lasting effect, producing a hyperæmia with prolonged hemorrhage in one part of the cases, while in the "nephralgia" forms the soreness and tendency to further colics might be caused by such retention.

If we suggest that a congestion was at the bottom of our cases, what brought on this congestion in the first place? It is trauma of which we think first. All the men were of strong, vigorous physique and in the most active years of their life. They were all exposed to hard bodily exercise. In all our cases it was the right kidney which we found to be affected. We know that the right kidney is more exposed to mechanical disturbance than the left one. In addition, in two patients the shortness of the space between the ribs and the crista was noticed.[2]

As special anamnestic data we find, that in Case I the hæmaturia set in in three to five weeks after hurting of the back in lifting. In Case II the first attack of colic came on after a ten hours' ride on horseback. Such per force rides one finds several times mentioned in the literature as an etiological factor for "essential hæmaturia." Case III was a farmer, in whose history, however, no special trauma was known. The last two patients, the one with a ureteral stone and the other with hæmaturia and colics due with reasonable probability to a stone of the ureter, were railroad men. The first one of them described the jarring of the engine in vivid terms. Could a blood-clot have been the first start for the ureteral stone and so the trauma be the cause for the single stone in this individual?

[2] Brewer found experimentally that not only obstruction of a dog's ureter but also bruising the kidney produced infection.

Was a blood-clot the cause for the hæmaturia and colic in the other case, instead of a suspected kidney stone? And in Case II of the former cases with the "essential colic," was it also a blood-clot that blocked the ureter and thus produced the train of symptoms? But this appears perhaps too one-sided.

To give a few data from the literature I might mention the interesting controversy between Israel and Senator (*Deutsche med. Wochenschr.*, 1902) concerning the explanation of the class of cases under discussion. Israel, leading the way, had published a number of cases, in which he had made nephrotomy with negative macroscopic findings, and had found in some of the cases nephritic changes, which he considered the most frequent cause for the colics and the hæmaturia. Senator contended that this etiology was not sufficiently proven by the cases, in which a microscopic examination with the exception of two cases was missing. He suggested that stones or tuberculosis or small neoplasms, etc., were probably overlooked. Abnormal perinephritic fixation of the kidney he admitted as a very plausible cause. On account of entirely negative findings Senator considered some cases as a localized renal hæmophilia. This theory explains nothing further. Hæmaturia in hæmophiliacs is a different thing. Such cases have been observed and just lately good results are reported in this kind of patients by injections of normal blood serum, as they are now generally recommended in hæmophilic bleeding.

Klemperer had published cases where in apparently healthy kidneys of neuropathic persons copious hemorrhages seemed produced by vasomotor influences.

The earliest and best observed case of renal colic with copious hemorrhages belonging to the group of "essential hæmaturia" was reported by SCHEDE, who performed nephrectomy. He found severe disintegration of the epithelia, especially in Henle's loops. The lumina of the tubuli were filled with detritus. There were a few hyaline casts, now and then calcareous concretions, and fatty degeneration of the epithelium. The most striking were the interstitial changes. All through the whole kidney were foci of partly very recent, partly older, partly quite old interstitial inflammation. Tubuli compressed or cystic. The glomeruli or their remnants in dense connective tissue. Everywhere blood-pigment. Glomerular capsules thickened; their capillaries hyaline bloody masses in the capsular spaces. Desquamation of the capsular epithelia. In the tubules

a few blood casts. Slight hyaline degeneration of the blood-vessels and thickening of intima. No micro-organisms.

DORST (*Centralblatt für innere Med.*, 1903, No. 25, p. 605) reported a case of "pseudo-essential" hæmaturia. Subjective symptoms not marked. With the separator he received clear urine from the right and bloody from the left side. Three long periods of hæmaturia within five years. On operation a chronic hemorrhagic glomerulonephritis was found. A small particle of the kidney had been removed for microscopic examination. Turbid swelling and slight desquamation of the epithelium of the tubuli contorti. Slight hemorrhage in the tubuli recti and some hyaline casts. Two obliterated glomeruli.

This case comes very close to the findings in our cases. However, Dorst considered them more as outspoken inflammatory changes than we do.

P. WOLFF of Hamburg (*Muenchen. med. Wochenschr.*, 1903, No. 29) made nephrotomy on a man of 46 years for bleeding from the right kidney. Severe bleeding then necessitated nephrectomy. He found microscopically obliteration of a few marginal glomeruli and moderate signs of irritation as consequence of the manipulation during the nephrotomy. No parenchymatous and interstitial changes. Wolff classes his case as renal hæmaturia without anatomic lesion, of which group he thought only six cases were known up to that time.

This case, too, is very much related to ours. Were the signs of irritation due to the nephrotomy or not? Wolff considers the few obliterated marginal glomeruli as unimportant.

In 1904 H. SCHUELLER (*Wiener klin. Wochenschr.*, Nov. 17) reports a renal hæmaturia in a woman 49 years old. The right kidney is split open, looks normal. Microscopically chronic nephritis.

ILLYES (*Deutsche med. Wochenschr.*, 1906, Nov. 10): Nephrotomy for bleeding in a man 44 years old. Microscopically normal tissue.

TADDEI (*Morgagni*, 1907, Nov. 13; reported in *Centralblatt f. Chir.*, 1907, Nov. 26): Hæmaturia from the right kidney in a man of 23 years. Nephrectomy. Sclerotic processes on the glomeruli, circumscribed round-cell foci in the cortex, and thickened ureter with alterations of its epithelium led the author to consider the whole as an inflammatory process.

STIENTHAL (*Beitr. z. klin. Chir.*, Bd. liii, Hft. 3, 1907) claims that up to 1907 there were hardly more than four exactly observed cases of essential hæmaturia on record. He made an incision into the kidney 4 cm. long. Profuse bleeding made him use a tampon in the kidney besides suturing of the organ. Severe bleeding followed and necessitated nephrectomy after five days. Negative microscopic findings.

MILKO (*Centralblatt für Chir.*, 1907, No. 49): "Essential Hæmaturia." Already before the operation the patient was nearly bloodless, therefore nephrectomy.

CASPER (*Centralblatt f. Chir.*, 1907) reports two cases of chronic double-sided diffuse nephritis which were without symptoms for a long time. No casts nor albumin, but severe and long-lasting hæmaturia from only one kidney. Then two cases of hæmaturia are reported where no nephritis but only smallest changes were found. In both cases œdema of

the kidney was noticed as consequence of obstruction of the tubules with blood.

KOTZENBERG (*Med. Klinik*, Nov., 1907; reported in *Centralblatt f. Chir.*, 1908, p. 170): Two cases from the Hamburg-Eppendorf clinic, where severe hemorrhage was thought to be due to tumor and a nephrectomy was made in both cases, but the kidney was afterward found intact. In Case I (man of 60 years), the patient bled to death during the operation. Microscopically both kidneys showed increased leucocytes in the neighborhood of the glomeruli. Epithelium of convoluted tubules was mostly fattily degenerated. Thickened intima in arteries. In Case II, a young man of 18 years, the inspection of the kidney by operation produced a severe hemorrhage and after a few days nephrectomy followed. Then after first improving the patient died six months later from insufficiency of the remaining kidney. The microscopic changes were about the same as in Case I. Kotzenberg thinks that in both cases the cause was a toxic injury to the kidney.

SEELIG (ANNALS OF SURGERY, September, 1908): Three cases of hæmaturia in appendicitis cured after excision of appendix.

RANSOHOFF, in Keen's "Surgery," mentions a case of essential hæmaturia presented by Nickolish to the Paris Academy. In Vienna this kidney had been declared normal; in Paris Albarran and Motz found marked evidences of glomerulonephritis. Ransohoff reports in the same place a case of his own where the glomeruli were generally normal, but in certain areas distinct atrophy with granular changes had occurred. Whether these were marginal glomeruli he does not say. Much blood was microscopically found, both intra- and extravascular. The patient was well after five years.

These few data are given for comparison and not in the idea of having exhausted the literature. Cases reported without microscopic examination were *eo ipso* mostly excluded.

As to the technic of nephrotomy, Israel demands that these kidneys should not be sutured, but simply packed. Suture gave, however, in all our cases very satisfactory results, all the patients walking out of the hospital in two weeks or less, without any urinary discharge from the wound of any account at any time. I do not think that packing of the severely bleeding kidney combined with suturing of it, as Prof. Steinthal did in his case, is as effective as complete suturing. First, the area directly adjoining the pelvis is exactly sutured by a continuous catgut. Some of the largest blood-vessels are found here, especially in the areolar tissue of the calices (arteriæ interlobares, or better, their branches). Fortunately this layer, where the most important suturing is to be done, is the most resistant, and one can quite well use the necessary force in

pulling on the continuous suture to secure these vessels. Suturing in this way I have not had any mortality nor any alarming postoperative bleeding. With this same or a second suture we can occlude the vasa arciformia which run parallel to the surface between cortex and medulla. After this the cortex and capsule are approximated with the same continuous catgut thread. If the needle catches now and then the under suture, this interweaving adds to the firmness of closure of the cut vessels. Larger vessels, where seen, are best pierced by the catgut. Figure " 8 " catgut sutures may be used instead of the several layers of continuous suturing. The inner loop then catches the arciform vessels together with the firm tissue at the calices.

A number of authors had to make a nephrectomy later on for continued bleeding after a nephrotomy. The exact suture of the vessels as mentioned above insures us more or less against this and I should not hesitate to make a second nephrotomy with more complete suturing of the kidney, especially in the area of the large vessels, much preferring an organ with numerous infarcted and sclerosed areas to a missing organ. There must always remain uninjured portions enough which, if need should come from insufficiency of the other side, could hypertrophy; and we know that the kidney tissue is very capable of such, as long as it is healthy. In such a sutured kidney there are entirely normal areas to be reckoned with beside the infarcted ones. It is not like a common sclerosed kidney. A second nephrotomy could of course not be done on an individual that has lost too much blood by undue procrastination, and thus again we see that active surgery, if combined with careful judgment, can prove itself to be conservative in the true sense.

General Conclusions.—We cannot be too careful in judging the cases of " essential " hæmaturia and colics; and a long observation is necessary for a somewhat positive diagnosis.

Trauma, among other causes, seems to play a great rôle in the etiology of these cases. The microscopic picture of the urine may show signs of severe kidney irritation, or nothing but blood. The hæmaturia may be lasting for weeks and

months, and still there may be no palpable cause found when nephrotomy is performed, except perhaps a few perinephritic bands of adhesion. Yet after operation such a hæmaturia can cease and the kidney can become and remain normal in its function. The renal colic with the most disquieting microscopic appearance of the sediment in the urine of one side can after operation disappear completely, the colic never to return, the urine to remain ideally cleared up.

The microscopic appearance of the kidneys in our cases was a picture which in this group of cases must be frequent, and consists of hemorrhage and epithelial desquamation in the glomeruli, and especially of a distention with desquamated cells and blood in the tubuli contorti. This bleeding and exquisite profuse desquamation is surprisingly free from the signs of a true inflammation, there being no diffuse leucocyte infiltration in the stroma, nor any outspoken turbid swelling of the parenchyma. The lack of such signs of diffuse inflammation is the reason for the possibility of thorough repair, and classes this desquamative process apart from the cases of chronic nephritis. A great sudden passive or active overtension in the kidney can explain such clinical and microscopic pictures, and this is supported by the identical findings in a kidney right after an attack of renal colic due to a ureteral stone.

If treatment, in which prolonged rest, diet, calcium salts, and perhaps serum for the hæmophilia cases play an important rôle, is fruitless, and if eventually ureteral catheterization, which had in some cases a curative effect, was tried, the operation of choice is the nephrotomy, though its serious effect upon a rather extensive area of kidney substance must be kept in mind. Longitudinal splitting of the kidney gives good chance for inspection and good results. Drainage of the kidney itself is as a rule not needed nor advisable. Careful complete catgut suture of the kidney in layers (or by figure "8" sutures) gives very good results. Especial attention must be paid to the suture of the innermost layer. The patients need usually not be in bed any longer than about ten days, and the operative chances are quite good.

RENAL VARIX.

ANGIOMATOUS DISEASE OF THE PAPILLÆ RENALES.*

BY PAUL MONROE PILCHER, M.D.,

OF BROOKLYN, NEW YORK,

Consulting Surgeon to the Eastern Long Island Hospital; Attending Surgeon to the German Hospital of Brooklyn; Associate Surgeon to St. John's Hospital; and Attending Cystoscopist to the Jewish Hospital.

THE object of the present note is to submit certain observations which seem to establish a definite pathological lesion for a hitherto indefinite condition, and to place upon a sound rational basis a method of treatment which hitherto has held only an empirical footing.

It is not necessary to review at length all the theories concerning the etiology of the unexplained cases of so-called idiopathic, essential, or symptomless hemorrhage from the kidney. It is sufficient to say that even the present-day writers employ the expression "essential hæmaturia" to designate those cases of hemorrhage from the kidney that arise suddenly, without warning, without discoverable cause, and devoid of symptom other than the presence of considerable blood in the urine and the consequent anæmia that accompanies it. The disease, when all the facts are known, is not easily confused with other conditions of the kidney which give rise to hemorrhage. Even if the diagnosis be obscure before operation, exploration of the kidney differentiates it from neoplastic disease, tuberculosis, calculus, stricture, and nephritis.

The history of all the cases is very much alike. The patient, usually in good health, suddenly notices the presence of blood in his urine. There is nothing to account for its presence; there has been no undue exercise, no injury, no infection, no history of renal colic; no pus cells, epithelial elements, crystals, tubercle bacilli, or other abnormal ingredients are found in the urine, other than blood, which is at first small in amount, then either increasing or decreasing, and often at

* Read before the Brooklyn Surgical Society, March 4, 1909.

times absent altogether; in some cases, the amount of blood is influenced by exercise, while in others this plays no part. In two cases of my own, the quantity of blood seemed to be greater in the morning and to lessen as the day advanced. It occurs with varying frequency in both men and women over twenty-five years of age. Some patients have had alcoholic habits, while others have been total abstainers; in fact, there is no type nor class of person in whom the disease has been more frequently observed. The hemorrhage may last but a few days, only to disappear and recur again after periods of weeks or months or even years; or, again, it may be continuous from the first, causing progressive anæmia.

As a rule, the urine is loaded with blood and, at times, with free hæmoglobin; the blood-cells are evenly distributed throughout the urine, appearing in all parts of it as it is evacuated from the bladder; clots may be found in the bladder, to be expelled at intervals; as the specimen stands, the cells rapidly fall to the bottom of the glass container; and it has been observed in my own cases that the urine retains its reddish color after precipitation of the cells, probably due to free hæmoglobin.

The urine shows no evidence of renal disease other than a reaction for albumin in proportion to the amount of accompanying blood serum, excepting where nephritis is present—a condition which of itself may give rise to hæmaturia, but which should not be classed with the cases under consideration.

Rarely the patients complain of pain or distress in the affected kidney or over the bladder, but it has been observed in some cases that all the pain and discomfort have been referred to the opposite kidney. The disease is always unilateral; and no cases, so far as I can learn, have ever been reported where the disease affected both kidneys. It is true that symptomless hæmaturia is frequently bilateral; but those are the cases due to malaria, hæmophilia, drug-poisoning, nephritis, or other cause quite different from those included in the present report.

Diagnosis.—The first consideration is the history which

the patient presents, such as has been described above. One naturally thinks first of malignant disease, papilloma, hypernephroma, malaria, nephritis, hæmophilia, or renal varix; more rarely of stones or tuberculosis.

It is not essential in the present paper to go over all the causes of hæmaturia in discussing the establishment of a diagnosis. It is necessary, in the first place, to exclude the urethra, the prostate, the bladder, and the ureter as sources of the bleeding; and there are but two ways in which this can be done with accuracy, (1) by surgical operation and (2) by the use of the cystoscope; of the two methods, the cystoscope is the more accurate, although errors have been recorded in both cases. By the aid of the cystoscope and the ureteral catheter we determine that the bleeding is coming from one or the other kidney; this is the most important point of all, and it then only remains to determine what is the probable cause of the hemorrhage. There are some cases where, owing to the large amount of blood present at all times in the urine, it is almost impossible to make a satisfactory cystoscopic examination; if repeated washings of the bladder do not clear up the blood, the bleeding is more probably of bladder origin, but if this can not be definitely made out, in the presence of the symptoms of renal varix it is indicated to do an exploratory operation upon the kidney.

By the aid of the X-ray or the wax-tipped ureteral catheter, the presence or absence of stone can be determined with considerable accuracy; aside from this, the symptoms of renal colic, together with a transitory and insignificant amount of blood in the urine, and the entire symptom-complex, as a rule, are sufficient to differentiate it from renal varix; but in some cases nephrotomy is necessary to the final establishment of a diagnosis.

Chronic nephritis, with unilateral hæmaturia, is probably the most difficult disease to exclude, and this is not always possible even at operation.

In a case reported by Freeman,[1] the only clinical difference

[1] Freeman, L.: Annals of Surgery, vol. xxxix, 1904, p. 370.

to be noted from a diagnostic standpoint was that casts were found; and these were not definitely made out until after operation.

In tuberculosis of the kidney, the bleeding has in our own experience been so insignificant that it should never be confused with renal varix; in addition, pus will always be found and, at some period, tubercle bacilli with other systemic expressions of the disease.

Neoplasms of the kidney are not so easily differentiated; many times it is impossible until after the kidney has been laid open to say definitely that a new growth is not present. However, except in the case of papilloma of the kidney, which is extremely rare, the bleeding is markedly less in amount, is more influenced by exercise, and the cachexia is more extensive in proportion to the loss of blood.

Analysis of Reported Cases.—In March, 1893, Dr. A. L. Stavely reported, in the *Johns Hopkins Hospital Bulletin*, vol. iv, p. 25, two cases of hæmaturia with catheterization of ureters and exploratory nephrectomy.

Case I.—The first case was a patient aged 39 years, married seventeen years and mother of five children; two weeks after the birth of the last child she found that her urine was deeply stained with blood, and contained clots; this lasted but a day, and there were no other symptoms. Six months later, blood again appeared in the urine, remaining for one day; after that, attacks of hæmaturia occurred with greater frequency and persisted a longer time, until a year before her admission to the hospital, when they appeared every two weeks and lasted a week each time.

Five weeks previous to her admission to the hospital she had constant hæmaturia and was passing urine with great frequency, while a few days before entering the hospital she expectorated a few clots of bright blood and mucus streaked with blood; there was a family history of tuberculosis. She was well nourished, but extremely anæmic; bowels regular; had hemorrhoids and a slight prolapse of the rectum; slight œdema of the feet; passing urine every two hours; temperature and pulse normal; signs of consolidation of the apex of the right lung; heart negative; kidneys not palpable. Blood count showed 3,172,000 red corpuscles and 10,000 leucocytes; hæmoglobin was 45 per cent. Specimens of urine examined two hours after passing showed 110,000 red blood-cells to the cubic millimetre; by this it was estimated that she lost 17 c.c. of blood in 24 hours. Some flat epithelial cells were found in addition to the blood; no tubercle bacilli were found.

Cystoscopic examination showed the bladder to be clear; urine col-

lected from the left kidney was acid, contained a large number of red blood-cells, some leucocytes, a few amorphous urates, ureteral cells in groups and singly. The right ureter could not be catheterized. An incision was made in the base of the bladder and the right ureter orifice exposed and catheterized, the catheter passing to the pelvis of the right kidney; the urine from the right kidney contained a trace of blood, probably due to traumatism. The left kidney was exposed and bisected, and no point of disease either in the pelvis or in the parenchyma could be found. The kidney was sutured with interrupted catgut and the wound closed.

Two days after operation the urine still contained blood; two weeks after operation there was no trace of blood in the urine and the patient was discharged cured. She is reported to have had a slight recurrence, but this is doubtful.

Case II.—The second case was also a woman; she had been married seventeen years; one child and four abortions, the last one two years ago. She was well nourished but very anæmic, with a history of various cardiac pains, headache, nausea, and poor appetite. A year previously she had developed hæmaturia and it had continued without interruption up to the date of her admission to the hospital; it appeared suddenly, was accompanied by no bad symptoms, and became worse the longer it lasted; besides the gradual increase in the quantity of blood passed she noticed occasional exacerbations. Physical examination of the chest was negative. Vaginal examination showed relaxed outlet and sagging of the uterus. Examination of the urine showed specific gravity 1.020; slightly acid reaction; large quantity of albumin, and a heavy, dark-red, uncoagulated sediment.

Microscopical examination showed numerous red blood-corpuscles, a few leucocytes, and a few large, flat, epithelial cells, but no casts.

Cystoscopic examination showed no abnormalities of the bladder; urine from the left kidney was dark with contained blood-cells; there were a few leucocytes and large epithelial cells; reaction slightly acid. Urine from the right kidney was a clear amber color and contained several epithelial cells; reaction strongly acid; no albumin. On mixing the urines from the right and left kidneys the color was found the same as that discharged from the bladder.

Operation was done by Dr. Kelly. The kidney was incised along the back, extending two-thirds of its length and down into the pelvis; the pelvis and all other parts of the kidney were carefully examined and no evidence of any disease was found. A piece was then removed for microscopic examination and the wound closed with interrupted catgut sutures, and the organ returned.

The day following the operation the urine presented a reddish-black color; specific gravity 1.025; reaction neutral; large amount of albumin; heavy reddish-black sediment; large number of blood elements; hyaline and blood casts and renal epithelium. The fourth day this had cleared up to a great extent. On the fifteenth day the urine was perfectly clear had a specific gravity of 1.016, with only a trace of albumin and a few

pus cells. On the nineteenth day the patient was discharged from the hospital, and her urine was absolutely free from red blood-corpuscles.

The microscopical examination of the section of this kidney, made by Dr. Flexner, was reported as follows:

"The section of the kidney passes through a part of the cortex only; just beneath the capsule the tubes are a little atrophied and a number of fibroblasts are visible in such places. Around some few glomeruli the capsule of Bowman is thickened slightly and these glomeruli are correspondingly atrophied. In such areas there is an increased number of fibroblasts between the tubes; the epithelium of the convoluted tubules is granular, swollen, and somewhat broken up; a few epithelial cells are found in which the nuclei are absent; no blood in the tubules seen in the section."

In commenting on this case the reporter says that the etiology still remains obscure in spite of the fact that the disease was localized in one kidney, and that the kidney alone must be considered the source of the hemorrhage. The careful examination and palpation of the pelvis of the kidney was sufficient to exclude neoplasm or calculus; further, there was no reason to suspect acute Bright's disease in either case, and there had not been any acute fever nor had the patient been subjected to the influence of any toxic agent.

The facts which the writer of this paper would emphasize in reviewing these cases are, that they present the typical symptoms, as outlined above, of renal varix; that they both were unilateral renal affections; that in the first case were present varices of the hemorrhoidal veins; that in neither case was any nephritis present; that in neither case were sections made of the papillæ; that in the second case a microscopical examination of the cortical portion of the kidney demonstrated blood absent in the tubules, proving the hemorrhage to have originated in the papillæ; and, lastly, in both cases, nephrotomy and complete section of the large connecting veins of the kidney was followed by uneventful recovery.

Of a series of seventy cases collected by Bunts,[2] in which the source of the hemorrhage was undoubtedly the kidney, in all, with two exceptions, no adequate cause for the bleeding could be found. Not all the histories in this series are complete. The duration of the hemorrhage in these cases ranged from fourteen days to twelve years, averaging twenty months. Nephrotomy was performed in thirty-eight cases, with a sec-

[2] Bunts, F. E.: Cleveland Medical Journal, June, 1908.

ondary nephrectomy in three cases. Nephrorrhaphy for movable kidney was done in three cases. In this series there was no recurrence of hemorrhage reported in forty-one cases; in two cases the hemorrhage was reported as continuous, and in both of these cases blood-casts were present before operation. In a few cases the hæmaturia returned after a period of one, one-and-a-half, two, and three years. It is noteworthy that relatively few of these cases were subjected to microscopic examination, and in none of this series were both kidneys affected.

Dowd [3] reported the case of a man, forty-nine years of age, who began to suffer from painless hæmaturia nine years ago; it lasted for two years, ceased for four years, then recurred, and had been continuous for the past three years. The urine contained about one-fifth its volume of blood; the bleeding was usually less when resting. Nephrotomy was done, with complete recovery. After operation, the urine showed a trace of albumin and a few hyaline casts, probably a result of the operation.

Fenwick,[4] of London, first called attention to the occurrence of angioma or capillary nævus of a renal papilla as the cause of painless hæmaturia. He reported three cases in which distinct vascular abnormalities were found in one of the papillæ of the kidney; two of these cases were cured by papillectomy, and one by nephrectomy. In his first case, the vessels of the mucous membrane covering the papilla were markedly varicose; in the second case, a bright red varicose condition similar to the first case was found; in each, recovery followed removal of the affected papilla. In the third case, in which nephrectomy was done, a dark-purple papilla appeared and a little blood was seen oozing from a point in the apex. He also reported three other cases, in two of which simple nephrotomy was done, followed by recovery; and one in which nephrectomy was done and the kidney found to be the seat of subacute

[3] Dowd, C. N.; Annals of Surgery, vol. xlii, 1905, p. 266.
[4] Fenwick, H.: Clinical Cystoscopy, London, 1904, p. 392.

nephritis. In the three latter cases, no abnormal condition of the papillæ was definitely made out.

In March, 1908, Whitney and Cabot[5] reported a case in which the tips of one or two of the papillæ at one end of the kidney were reddened and a little spongy; the microscopical examination showed the small venules at the tip of the papilla irregularly dilated, and covered on their free surface with a fine film of connective tissue and a single layer of epithelial cells, projecting here and there as varicose knuckles; no well-marked thrombi were found. The straight tubules of this region contained blood corpuscles, which were not found higher up, indicating this to be the source of the hemorrhage. MacGowan[6] reports a case of painless hemorrhage of two weeks' standing, in a man aged forty-five years; nephrotomy was done, and one papilla that was dark purple in color and was bleeding continuously was removed by a wedge-shaped incision; the sides were then united by one stitch of fine catgut, the kidney was sutured, and an uneventful recovery followed.

During the past year two cases have come under my personal care which belong properly in this class:

Case I.—Referred by Dr. William Moser. Man, aged sixty-two years, janitor by occupation, was admitted to the German Hospital of Brooklyn, on August 26, 1908. Family history negative. He did not use alcohol in any form; had never suffered from scarlet fever, rheumatism, diphtheria, or malaria; in 1898 he was ill with pneumonia; has had several attacks of influenza; has had hemorrhoids for several years with occasional bleeding therefrom. In November, 1907, he first noticed blood in his urine; this was shortly after an attack of influenza, and there were no other symptoms referable to the genito-urinary tract excepting some increased frequency of micturition; the hæmaturia was said to have been constant. During the months following, he did not feel well and had occasional attacks of dizziness, weakness, specks before the eyes, etc.; he also suffered from bleeding hemorrhoids.

[5] Whitney and Cabot: Boston Medical and Surgical Journal, vol. clviii, No. 21.

[6] MacGowan, Granville: American Journal of Urology, June, 1908.

In July, 1908, there was increasing weakness and dizziness, with alternating constipation and diarrhœa; he had no chills or fever, and at no time complained of pain; there was loss of appetite and specks before the eyes, but no tinnitus aurium. August 10, 1908, he began to have indigestion, manifested by vomiting following his meals, unaccompanied by pain or by blood in the vomitus; about the same time there was slight swelling of the ankles, which lasted for only a few days. The urine was constantly loaded with blood, and he often passed clots of blood; he would void his urine three or four times during the night.

In this condition he presented himself for treatment. He had an apathetic expression, and was anæmic rather than cachectic; the eyes were slightly sunken and watery; his temporal and radial vessels showed a very slight arteriosclerosis; he stated that he had lost considerable in weight; his bleeding hemorrhoids had caused him a good deal of suffering.

Examination showed that his heart was slightly enlarged and the first sound reduplicated at the apex; lungs showed signs of consolidation of the right apex; the liver was much decreased in size and was not palpable; abdomen was relaxed; no distention or tenderness; no masses could be felt and there was no ascites; a rectal examination showed dilated hemorrhoidal veins that were oozing; the lymph-nodes were normal; skin showed slight cachexia but no eruptions and no œdema; the lips were anæmic, teeth poor, and tongue coated; neither kidney could be felt; the urine showed a specific gravity of 1.024 and was alkaline in reaction, with a slight amount of albumin, was red in color and heavy with blood-cells and a few leucocytes; the external genitals were normal.

Cystoscopic examination showed some congestion about the mouth of the left ureter, otherwise the mucous membrane of the bladder was normal; no obstruction in either ureter; urine drawn from the left kidney was bloody, that drawn from the right kidney was clear. Patient had been treated with potassium iodide in 5-grain doses, strychnine sulphate, calcium lactate, and by rest in bed; but there had been no difference in the amount of blood in his urine. A probable diagnosis of renal varix was made, and nephrotomy advised; operation was rejected until two weeks later, when his condition became so grave that he at last consented to an operation. At this time his hæmoglobin was found to be 35 per cent.; leucocytes, 15,200; polymorphonuclear leucocytes, 49

per cent.; small lymphocytes, 50 per cent.; eosinophiles, 1 per cent. Morphologically, the cells showed advanced poikilocytosis with marked anæmia; lymphocytes were all small.

In this desperate condition he was subjected to operation, with temperature of 99°, pulse 96, and respirations 22.

Operation, December 12, 1908, by the writer. A rapid nephrectomy was done without any seeming shock to the patient; not more than a drachm of blood was lost during the operation; upon exposing the kidney it was found to be congested and the pelvis was swollen with contained bloody urine; there were no macroscopic changes in the kidney itself. The patient reacted well from the operation and his pulse never went above 112 nor his respirations above 24; during the next twenty-four hours he passed 1300 c.c. of urine; the pulse gradually became slower, and twenty-four hours after the operation his condition was perfectly normal; the urine passed was clear, showing that the source of the hemorrhage had been removed; the dressings were changed and the wound condition was perfectly satisfactory; during the day he felt more comfortable, and at midnight he was sleeping normally, with temperature 98.4°, pulse 90, and respirations 30. Shortly after that it was noticed that his respirations were more rapid, his pulse becoming weaker; at 2 A.M. there was sudden dilatation of the heart, and 2.10 A.M. he died, forty hours after the operation.

Examination of the removed kidney showed it to be normal in size, the parenchyma was normal, and no signs of nephritis were present; there was a small cyst in the cortex filled with clear fluid. Sections were taken from the papillæ, and a typical condition of varix was found; the numerous venous and arteriocapillary spaces were markedly dilated, so that in places there was but a thin wall of cells between a number of blood sinuses, and on the surface the blood sinuses approached so nearly to the mucous membrane that the slightest violence would probably cause their rupture; a rupture of these, however, was not necessary, as a transudation of the blood-cells and of the blood elements would be easy through so thin-walled a vessel if on an exposed surface.

It is to be emphasized that, macroscopically, nothing whatever was discernible in the kidney to indicate the varicose

condition of the papillæ. I know of no previous case in which such a condition has been proven to exist; all the cases reported, as already outlined, have shown macroscopic changes that drew the attention of the operator to one or another of the papillæ, and, in some cases, actually oozing points were seen.

In the present case reported, if the kidney had been split and the pelvis inspected, the organ would have been pronounced normal, and only upon microscopic section was it proven that the diagnosis of renal varix as the cause of the hæmaturia was correct.

I believe the actual presence of such a condition to be a very important observation, for it forms a basis for the more accurate treatment of future cases of renal varix that may be encountered.

The patient was evidently predisposed to venous varicosity, as demonstrated by the varicose condition of his hemorrhoidal veins. A varicose condition of the capillary portion of the renal veins is not to be wondered at, as we often have expressions of similar conditions of other tributaries of this vein. It will be remembered that the left renal vein crosses in front of the aorta just below the origin of the superior mesenteric artery; it is covered by the third portion of the duodenum, and receives the left spermatic or the left ovarian vein, and usually the left suprarenal, sometimes, also, the left phrenic vein. There are rudiments of valves in each vein where it joins the vena cava. We frequently see varices of the left spermatic vein, and there has been no satisfactory explanation given as to its occurrence, nor do I undertake to explain the cause of either the right-sided or left-sided renal varix, except to emphasize the fact that its occurrence might frequently be expected.

Case II.—Referred by Dr. V. W. Weed. Woman, twenty-eight years old. As a child, the patient had an attack of typhoid fever which was followed by some cardiac trouble the exact nature of which is unknown; she also claims to have suffered from malaria. Her menstrual history began at the age of nineteen

and shows no marked abnormalities. Married. There is a possible history of specific infection by the Neisser bacillus. She gives a history of burning micturition with frequency and urgency, shortly after marriage; had had no trouble during her pregnancy one year ago; has one child—normal confinement. Four months previous to examination she discovered blood in her urine evenly mixed with the same, and a few drops following the close of micturition; catheter specimen was bloody; there was never any colicky pain; two months ago she began to have some increased frequency of urination; would pass her urine once at night and sometimes not at all; during the day she urinated four or five times; during the last four weeks she complained of pain low down in the right side, but not severe; has lost twenty pounds in weight, and is steadily growing weaker; aside from this she does not complain of anything except the blood that she passed whenever she urinated; she stated that even after a night's rest the urine was as bloody as it was at the end of an active day.

Examination of the patient revealed a woman of slight build, moderately anæmic; heart and lungs normal; the right kidney was slightly enlarged, somewhat tender, and freely movable as far as the pelvic brim; the surface of the kidney was perfectly smooth; the left kidney was slightly movable. Urine: specific gravity, 1.017; acid; trace of albumin; no sugar; blood-cells.

Cystoscopic Examination, April 16, 1908: No abnormalities could be noted in the bladder, with the exception of some thickening of the muscular bands; bladder capacity, 16 oz.; no irritability; urine, as drawn from the bladder by the catheter, was very bloody and contained a large amount of fresh blood, not clotted; there was nothing in the bladder to indicate the source of this hemorrhage; after washing the bladder the medium remained clear for one hour. Ureter openings normal; easily catheterized.

Right Kidney.—Urine flowed with perfect rhythm, drops coming every 15 seconds, averaging 52 drops to the minute; the urine obtained was perfectly clear and contained no blood cells, but was slightly tinged red as if it contained hæmoglobin.

Left Kidney.—Rhythm normal; urine secreted very rapidly, 75 drops to the minute with an interval of 3 seconds between the drops; the urine was perfectly clear, almost the color of water.

Microscopic examination showed moderate number of renal

epithelial cells from which there seemed to spring buds without any definite structure.

April 20, 1908, the bladder was again examined and no point of hemorrhage was found therein; urine that came from the right ureter opening was distinctly abnormal. Both ureters were catheterized again, and the urine obtained from the right kidney contained a small amount of blood; that from the left kidney was normal.

Operation, April 30, 1908, at the German Hospital. The kidney was easily delivered through the wound; it was found to be partially turned upon itself, without, however, any torsion of the ureter; the kidney was enlarged, and its central portion seemed to be somewhat grayer in color than the two poles; a pedicle clamp protected by rubber tubing was used to compress the renal vessels. The kidney was then split from pole to pole, a little posterior to its median line, down to the pelvis; no abnormality of any kind could be found. The pelvis was carefully examined and was found perfectly normal in size and position; palpation of the kidney demonstrated no abnormalities. Four mattress sutures of catgut were used to bring the split surfaces of the kidney in due apposition and hold them there; the peripheral edges of the kidney were brought together with catgut sutures; after the clamp was removed—having been in place for about four minutes—there was free oozing from the kidney and it was found necessary to put in a few additional sutures. The kidney was then fixed to the muscular structures by four stay sutures of chromic gut, and the wound closed with the exception of an elliptical space 1½ inches long by ½ inch wide, which was packed with iodoform gauze. The patient stood the operation very well; during the first twenty-four hours there was considerable oozing of blood and urine from the wound, but during the next twenty-four hours this entirely ceased. Pulse, temperature, and respiration normal. An uneventful recovery followed, the wound healing *per primam.*

On the fifth day after the operation there were no microscopic or macroscopic blood elements to be found in the urine. From that day until the present—now ten months—she has remained entirely well and has gained greatly in weight; she has never had the slightest trace of blood in her urine since the operation.

In considering this case, the first point worthy of attention is the fact that the blood had been present in the urine without intermission for four months; that it was just as bad if not worse in the morning as at night; that there was a considerable amount of free hæmoglobin present in the urine; that she was thoroughly anæmic rather than cachectic. No microscopical section was made in this case, and no removal of kidney tissue was done. The clinical condition found at operation and the complete subsequent relief to the bleeding, following the nephrotomy, illustrated in an ideal degree the characteristics of the lesion under discussion.

TREATMENT OF RENAL VARIX.—The beneficial results of nephrotomy in cases of renal varix, as well as in hæmaturia due to other conditions, seem to be due to the peculiar distribution of the venous radicles at the base of the renal calices, as described by Broedel[7]:

"While there is a complete arterial division in the place connecting the posterior calices and terminating in the lateral path of the upper and lower calices, the veins follow a quite different arrangement. Around the base of the pyramids they anastomose and form venous arches; they unite in long branches and run between the sides of the pyramids and the columns of Bertini to the neck of the calices where they lie between the pyramids and the arterial branches. The thickness of these connecting veins accounts for the peculiar lobulated appearance of the base and sides of the pyramids. Around the necks of the calices, both anteriorly and posteriorly, these veins form a second series of anastomoses, much thicker and larger than at the base of the pyramids; this appears as a number of thick loops or rings which fit like a collar around the necks of the calices; *nearly all the collected blood of the posterior region is carried anteriorly through these short, thick stems* to join that of the anterior portion.

"*An incision through the posterior row of calices would avoid all the arteries, but would sever six of these connecting veins;* there remains, however, sufficient anastomosis at the upper and lower pole of the kidney, so that no serious consequence should follow a severance of these veins."

The importance of this arrangement of the venous stems in its relation to the operation for the relief of renal varix will be appreciated when the operation is described.

Palliative Treatment.—In all cases of sudden unexplained hæmaturia in which there is no reason to suspect stone,

[7] Johns Hopkins Hospital Bulletin, January, 1901, p. 10.

tuberculosis, trauma, or cystitis, the patient should be immediately put to bed and kept there; the diet should be restricted to milk and broths, and no exercise of any kind should be allowed. Examinations of the blood should be made for malaria, and the condition of the elements of the blood determined at the same time; the rectum should be examined for hemorrhoids, the scrotum for varicocele, and the legs for varicose veins. If the hemorrhage is more than transitory, a complete cystoscopic examination should be made and the exact location of the hemorrhage determined. The best drugs to administer to these patients are calcium lactate, 5 to 10 grains three times a day; Basham's mixture, 1 to 4 drachms in water three times a day; quinine sulphate, 25 grains a day; fluid extract ergot, ½ to 1 drachm every four hours. The exhibition of thyroid extract, adrenalin, and allied preparations is of uncertain value.

There is still another treatment that might be tried, and that is local applications to the papillæ by means of the ureteral catheter, using tannic acid, iodoform emulsions, alum solutions, or adrenalin chloride. None of these have ever been tried, but in a case where the patient absolutely refused surgical relief I would not hesitate to apply these measures.

Operative Treatment.—Three procedures must be considered under this heading: *Decapsulation of the kidney; bisection of the kidney; removal of the kidney.* In a typical case of renal varix, it does not seem probable to the writer that decapsulation and fixation of the kidney would permanently relieve the hemorrhage, although it would lessen the congestion and certainly tend to diminish the hemorrhage. After a careful study of the cases so far reported of unilateral symptomless hæmaturia in which renal decapsulation and fixation have resulted in recovery, I am able to find but two cases in which sufficient detail is given on which to base an opinion. One case was reported by Broca of a woman twenty-eight years of age, who had suffered from this condition for sixteen months. The urine from the affected kidney showed many granular casts. Decapsulation was done, with

recovery, and no recurrence after three years. This was unquestionably a case of hemorrhage in a kidney that was the subject of nephritis; and whether the condition was one of hemorrhagic nephritis rather than renal varix, it is difficult to say. Also, it is impossible to tell exactly in what way the sutures were passed to fix the kidney; if they were passed through the tissue of the kidney they might easily be so located as to restrict the calibre of the veins when they were tied, and in this way materially aid in the lessening of the hemorrhage.

Freeman[8] reported the case of a man 59 years of age, anæmic and emaciated, who first suffered from hæmaturia twenty years previously; it ceased spontaneously but has been repeated many times; the bleeding was profuse and clots were formed; the past year, the bleeding was continuous and was found to be coming from the left kidney. Renal decapsulation was done, and after ten weeks there was no evidence of a hemorrhage, no evidence of nephritis, and no blood-cells. A small piece of the cortex of the kidney, which was removed for examination, showed the tissue to be in an advanced state of arteriosclerosis; also a marked glomerulonephritis, with small-celled infiltration between the tubules. Here again, we have a case in which there was undoubtedly advanced nephritis with profuse hemorrhage from one kidney, which was relieved by decapsulation; but again we must not draw our conclusion without a further knowledge of the operative technic. Fenwick found that twelve per cent. of his cases of unilateral renal hemorrhage showed evidence of chronic granular nephritis.

Nephrotomy is indicated for two reasons: first, it allows a thorough exploration of the pelvis of the kidney; and if the diagnosis has been wrong it will be surely proven, as tubercular disease of the kidney, any new growth, stone, or other abnormality causing the hemorrhage will surely be discovered by this operation. In the second place, *it accomplishes exactly what the operation of multiple ligature does in the treatment of varicosities in other portions of the body. Six of the main collecting venous radicles of the kidney are severed and perma-*

[8] Annals of Surgery, vol. xxxix, 1904, p. 370.

nently closed, and the course of the blood-stream is instantly changed to the anastomoses at the upper and lower pole of the kidney; the injury to these veins, however, is not of any serious moment.

Technic of the Operation.—The kidney is exposed and an incision is made along Broedel's line; an incision through the middle of the kidney should be avoided because it would cut through larger vessels and cause more injury to the kidney structure, as well as causing more severe hemorrhage. The pelvis is freely opened and the anterior and posterior calices of the kidney thoroughly examined; if there be any gross varicosity of the papillæ, excision or a thermocautery operation may be done; otherwise, the cut surfaces of the kidney are to be brought together with mattress sutures and the organ fixed in position, a small portion of the cortex of the organ being decapsulated for the purpose. The mattress sutures in the kidney are placed at right angles to the large vessels.

Nephrectomy would be indicated, first, when rapid and bloodless operation is demanded; second, when nephrotomy has failed to relieve the hæmaturia.

CONCLUSIONS.

(1) Renal varix is a distinct pathological entity and may be described as an angiomatous disease of the papillæ renales, whose etiology and pathology resemble that of varicocele, varicose veins of the leg, varicosities at the cardiac end of the stomach, hemorrhoidal varices, etc.

(2) Many of the so-called cases of essential hæmaturia are due to this condition of the kidney.

(3) It has its own distinct symptomatology; but it may be impossible to differentiate it, before operation, from hæmaturia due to nephritis and hæmaturia due to renal papilloma.

(4) In the majority of cases, at operation, when the kidney has been bisected, no gross pathological lesions will be noted, but on microscopic examination of the papillæ renales a typical angiomatous disease will be found.

(5) Renal decapsulation and fixation of the kidney will cure the cases of unilateral hæmaturia due to nephritis.

(6) Nephrotomy is the operation of choice, because it allows a thorough examination of the kidney, and also for the reason that it accomplishes exactly what the operation of multiple ligation does in the treatment of varicosities in other portions of the body, in that it cuts six of the main connecting venous radicles of the kidney and in this way destroys the varicosities.

(7) The incision should be made along Broedel's line so as to avoid injury to the arteries.

(8) Nephrectomy is indicated only when rapid and bloodless operation is demanded, or when nephrotomy fails to relieve the hæmaturia.

OBSERVATIONS ON RENAL AND URETERAL CALCULI.*

BY GEORGE WOOLSEY, M.D.,

OF NEW YORK,

Professor of Anatomy and Clinical Surgery in Cornell University; Surgeon to the Bellevue Hospital and Associate Surgeon to the Presbyterian Hospital.

OF the many interesting features of renal and ureteral calculi the diagnosis is naturally the first. Great advance has been made in this essential factor since Morris wrote, in the second edition of "Surgery of the Kidney and Ureter," 1901, that "a correct diagnosis of stone in the ureter is not to be frequently expected," and, "unless a calculus in the ureter can be felt through the abdominal parietes, the rectum, the vagina, or the bladder, its precise location cannot be ascertained except by an exploratory operation."

This has been changed by perfecting the technic of the X-ray examination, aided, in some cases, by cystoscopy and ureteral catheterization. Though it takes an expert to take good X-ray plates, to show renal and ureteral calculi, and sometimes an expert to interpret them, the X-ray has revolutionized the diagnosis of these conditions.

Under such circumstances there is danger that the pendulum will swing too far, and that the clinical diagnosis will be overlooked or neglected. This is especially regrettable in view of the fact that an X-ray expert is not always available; secondly, because the X-ray fails in certain cases; and thirdly, because in the differential diagnosis from other conditions we must make a probable diagnosis, from the clinical symptoms, to suggest the need of an X-ray plate.

Both of the last two factors were illustrated in the case of Mr. G. M., who had suffered from attacks of gout for several years, and who was brought to the Presbyterian Hospital on August 13, 1905, with the diagnosis of appendicitis and the

* Read before the New York Surgical Society, February 10, 1909.

history that he had been suddenly taken with severe pain in the right lower quadrant of the abdomen, radiating up and back to the right lumbar region. There was nausea, but no vomiting, no frequency of micturition, and no blood visible in the urine. There was considerable prostration. The leucocyte count was 14,600; temperature, 99.2°; pulse, 84. The urine showed a heavy trace of albumin, a few blood-clots, and a considerable number of red blood-cells. At McBurney's point there was marked rigidity, muscular spasm, and tenderness. There was some tenderness in the right lumbar and the right hypochondriac regions. Rectal examination was negative. The clinical diagnosis of renal calculus, probably passing the ureter, was made; and operation on the appendix was refused, in spite of the importunity of friends. The treatment consisted of large amounts of bland water (Poland), and morphine during paroxysms.

August 17: At least one attack of pain has occurred each day, usually at night. Between attacks the patient was comfortable. Blood was present in the urine most abundantly after a severe attack on August 16, during which the pain was referred to the right lumbar and not to the right iliac region. The tenderness in the right iliac region, at McBurney's point, has gradually disappeared, but there is some over the right kidney. To confirm the diagnosis he was taken to an expert radiographer, as the hospital X-ray plant was being repaired. Several perfect plates were taken which showed no stone. On August 18, he had an attack of gout in the left big toe, and on the same day, the fifth day after the onset of the attack, he passed a very small, rough oxalate calculus and all symptoms were relieved.

In this case the slight hæmaturia, the intermittent character and the severity of the pain, with periods of almost entire comfort between the paroxysms, the position of the tenderness, in addition to that at McBurney's point, and the lack of evidence of inflammation, as shown by the pulse, temperature, and blood-count, taken together made me so sure of the diagnosis that, in spite of the negative X-ray findings, I resisted the appeals of his friends to operate on the appendix.

It is in the differential diagnosis between appendicitis and

renal and ureteral calculi that the clinical diagnosis of the latter is most often of particular importance. It is an excellent rule to examine carefully all cases of appendicitis without typical signs of inflammation for hæmaturia, and if the latter is found, and sometimes when it is not, to subject them to X-ray examination of the region of the kidney and ureter before operating on the appendix. According to Bevan, blood in the urine is found microscopically in many acute appendicitis cases, but in my experience this is rare. It has been the experience of most surgeons to have operated on cases of supposed appendicitis when a calculus was the actual pathological condition present, or to have operated for calculus when the appendix had previously been removed for the relief of the symptoms.

In the case of Miss T. B., from whose right kidney I removed by nephrolithotomy in July, 1906, an oxalate calculus of the size of a hickory-nut, which was clearly shown in the X-ray plate, this patient was operated on two years before for cystic ovary, retroflexion, and chronic appendicitis. Whether the renal calculus was then a cause of her subjective symptoms I cannot say; but from the chronic history and the condition of the stone I suspect that it was.

In addition to the case first mentioned, I know of several other cases of small calculi failing of detection in the X-ray plate; but larger stones may also fail to be shown in plates taken by an expert, as has been pointed out by Dr. F. Tilden Brown in the case of two uric-acid calculi of some size, and by many others. If the stones are pure uric acid or urates they will probably give no visible shadow, but fortunately they generally contain oxalates, etc., which give a distinct shadow.

In addition to the occasional failure of the X-ray to show a calculus when present, we must be on our guard, in suspected calculi in the pelvic portion of the ureter, against the so-called false shadows. These are now better understood and guarded against, especially if the X-ray is taken with a styleted catheter in the ureter in cases of doubt.

An interesting example of this source of error was presented in the case of Mr. R. T., aged 42, admitted to my service in the Presbyterian Hospital, September 1, 1908, with the history that eight months before he had been seized with a very severe stabbing pain in the right lumbar region, radiating to the bladder and penis, with retraction of the right half of the scrotum and frequent micturition. This attack increased in severity for five hours, continued for thirty hours, and suddenly ceased. Similar attacks occurred two days and two weeks later, and during the six weeks before admission four such attacks had occurred, the last one three days before. For the past six weeks he had had an almost continuous bearing-down pain in the hypogastrium, a sense of heaviness in the bladder, frequent desire to micturate, and some rectal tenesmus. He had never passed blood in the urine. For the past eighteen months he had been taking arsenic for what he was told was pernicious anæmia.

Two X-ray plates showed three shadows in the position of the ureter, at about the level of the sacrosciatic ligament. On cystoscopic examination by Dr. Osgood the ureteral catheter passed readily and the instrument failed to reveal the presence of a stone. But the clinical symptoms were typical and the ureteral catheter often easily passes a calculus in the ureter. On operation, September 10, 1908, the ureter, embedded in rather dense cellular tissue, was followed to the bladder. No stone was definitely felt, the adherent cellular tissue rendering palpation uncertain. The pelvic ureter was then opened and a probe, passed toward the bladder, met an obstruction just above it. Another longitudinal incision was made just above the obstruction, but as the stone could not be dislodged upward it had to be removed through a third incision directly over it. It was of the size of a small split pea, but oblong and with a mulberry-like surface. Just below this but outside of the ureter, and apparently outside the pelvic fascia, were two or three free, hard, oval masses. One of these was dug out by the finger, and on subsequent examination by Dr. Osgood it was found that it presented the structure of true bone. These bodies gave at least two of the three shadows in the X-ray plate.

Other sources of extra-ureteral shadows are more common, especially calcified lymph-nodes, and the small ossified areas

in the pelvic ligaments. The latter give small round shadows in the vicinity of the ischial spine, often multiple and frequently bilateral.

Although the position of the ureteral calculus is indicated by the X-ray, yet in the pelvic ureter, owing to its obliquely curving course, the exact position may not be easy to predict from the plate. With calculi in this position I have found it useful to examine and palpate the pelvic ureter through an opening in the peritoneum, which is sutured as soon as the finger within the peritoneum has assisted that without to locate and expose the calculus. This was first practiced through an opening accidentally made in the peritoneum by a retractor, and was found so useful that I have employed it in some cases since then, in one exploration confirming a negative finding. Dr. John H. Gibbon of Philadelphia has also employed and recommended a similar procedure. It would serve a very useful purpose in the exceptional cases mentioned by Bevan, where the symptoms are referred to the side opposite to the stone.

As to calculi in the lower ureter my experience coincides with that of Dr. Moschcowitz, who has reported that he has found them mostly between the pelvic brim and the bladder, and not so much at those two points, where most statistics locate the greater number of calculi in the lower ureter. Although I have observed small vessels crossing this portion of the ureter in all cases, I have not noticed their connection with the arrest of calculi here which Dr. Moschcowitz suggests, though this is a likely cause.

In considering the question of operation in ureteral calculi it is important to remember to give the calculus a chance to pass the ureter provided that (1) it is not too large, (2) it has not remained long in the ureter, (3) there is no infection. In cases such as that of Mr. G. M., related above, time should unquestionably be given for the passage of the calculus, unless the pain is so frequent or so severe as to exhaust the patient.

Another patient, a young man, Mr. H. P., whom I saw in August, 1908, had had a typical attack of renal colic, and an X-ray showed a shadow in or near the course of the upper part

of the pelvic portion of the left ureter. Although advised to have another X-ray with a styleted catheter in the ureter, he did not return until driven by another attack in November, when another X-ray showed the shadow lower. The ureteral catheter would not pass more than ½–¾ inch up the left ureter, and the left ureter opening appeared œdematous, as seen through the cystoscope. Within a fortnight he passed the stone.

X-ray plates taken at intervals are very useful to indicate whether the calculus is passing or is stationary.

The X-ray is also very serviceable in enabling us to determine from the size of the calculus whether it is likely to pass or not. If distinct infection occurs operation should not be deferred, for the kidney and ureter will be progressively damaged.

In cases of renal calculus we have the choice between pyelotomy and nephrolithotomy. If there is no infection of the kidney or pelvis, pyelotomy is the operation of choice for single stones in the pelvis that are of moderate size and not very irregular, as Bevan has pointed out.[1] Thus in the case of W. S., a large stout man, aged 45, who was operated on by me at the Presbyterian Hospital, July 7, 1905, the right kidney could not be delivered through the wound. Without an extremely large incision, to allow the introduction of the hand to control the vessels, nephrolithotomy was far inferior to pyelotomy, for the stone could be plainly felt in the pelvis, and it was removed and the pelvis sutured without great difficulty. There was no leakage of urine.

Where there is infection of the pelvis or kidney and drainage is indicated I prefer nephrolithotomy, through an incision about 1 cm. behind the outer border of the kidney. Personally I have had no trouble with hemorrhage in the latter operation, for the vessels are controlled by the pressure of the fingers until they are secured by the catgut sutures. The only severe hemorrhage that I have had in operations on the kidney has been the result of freeing the kidney from the capsule,

[1] Transactions of the Am. Surg. Asso., 1908.

where the latter was so adherent to the fatty capsule as to make the extracapsular exposure of the kidney not feasible.

After the removal of ureteral calculi through an extraperitoneal incision I have always closed the latter by two or three sutures of fine catgut without making a carefully exact closure or using two rows of sutures. I do not know that the sutures employed have served any useful purpose, for there has usually been some leakage of urine. If the ureter is not much dilated it acts as a capillary tube and suture is hardly necessary.

As in any case leakage of urine may occur I have always used drainage after opening the ureter. One experience with drainage is instructive as showing the danger of the use of a rubber tube instead of a cigarette or rubber-tissue drain. In the case of R. T., mentioned above with the history of a progressive or pernicious anæmia for eighteen months, the cigarette or rubber-tissue drain was replaced by a rubber tube on the sixth day after operation. This was removed six days later because there was considerable oozing of blood through the tube and several clots were passed through the urethra with considerable pain. He did well until five days later, when there was a fresh hemorrhage from the sinus and into the bladder. In spite of saline infusion and direct transfusion of blood he died the same day, the poor condition of his blood making him unusually susceptible to the loss of a moderate quantity of blood. I attributed the hemorrhage in this case to the use of the rubber drainage tube and would strongly advise against its use. This advice is strikingly reinforced by the case recently reported [2] by Dr. Moschcowitz, where, after the removal of bilateral ureteral calculi rubber drainage tubes caused a pressure necrosis of both external iliac arteries, necessitating their simultaneous ligation, which was successful.

I have seen a fatal hemorrhage from the erosion of mesenteric vessels by a rubber tube in an abdominal abscess, secondary to appendicitis; and I do not think it safe to have rubber drainage tubes for long in abdominal cases, where the respira-

[2] Annals of Surg., Dec., 1908.

tory and peristaltic movements of the contents may cause the tube to erode a large vessel.

A final point of great interest and importance is the question of the ultimate results in cases where renal or ureteral calculi are associated with infection of the kidney and ureter. Where the infection is recent or moderate it commonly subsides soon after all calculi are removed. But how is it where the ureter and the pelvis of the kidney are distended with pus or the kidney tissue is largely replaced by abscess cavities? There is hope for complete recovery or a return to a useful and comfortable condition even in these cases. These two varieties of results are illustrated by the two following cases.

In the case of Mrs. M. C., 32 years old, who entered the Presbyterian Hospital January 8, 1908, there had been left renal colic at intervals of a week to a month for a year, commencing two years ago. The sharp pain radiated from the left lumbar region toward the external genitals and the inner side of the thigh, lasted about half an hour, and was relieved on lying down. Then there was an interval free from attacks until four weeks ago, when there was a severe attack of left lumbar pain, repeated every two to three days for two weeks, with some chills, vomiting, and night sweats. She had never noticed blood or gravel in the urine. For the last two weeks there had been some soreness over the bladder and sharp pain at the onset of micturition. There was a daily rise of temperature, and the urine on examination contained a little pus and a few red blood-cells. A catheter specimen gave a pure culture of colon bacilli, no tubercle bacilli. The X-ray shows a small stone, about the size of a date seed, at the upper end of the ureter. This was removed by operation on January 21, through a left lumbar extraperitoneal incision. After incising the ureter over the stone, about two inches from the pelvis, it was removed and pus followed the stone, and the amount of pus was much increased on pressing the kidney. As the pelvis and calices were much distended with pus an incision was made into them through the outer border of the kidney for drainage. The tube was removed on the eleventh day. The ureter was not sutured. The pus from the kidney gave a pure culture of colon bacillus. A month later there was only a small shallow sinus

which soon healed. I saw her eight months later, when the urine was normal, she was in blooming health, and was several months pregnant. Probably the marked infection had occurred at the time of the attack, about six weeks before the operation, so that the kidney tissue had not had time to suffer greatly from infection, nor had it atrophied appreciably from the distention of the pelvis. A complete cure resulted here.

The other extreme of infection and a more serious condition was present in the case of Mrs. S. S. 44 years old, who was admitted to the Presbyterian Hospital, October 31, 1906. For twenty years, at intervals of about four months, she had suffered from colic, which began in the right lumbar region and radiated to the right lower quadrant of the abdomen and the outer aspect of the right thigh. There was no nausea or vomiting, no stone had passed, and no blood was noticed in the urine, but the latter had been cloudy for the past fifteen years. In March, 1906, I operated on her right kidney in Bellevue Hospital. The right kidney was much enlarged and displaced downward and was readily palpable. It was incised along the outer border and three stones removed. One of these, as large as an egg, had a stem-like process which had projected down the ureter. A part of this stone had apparently been chipped off and rubbed against the larger fragment until the opposed surfaces were worn smooth. It was shown at a meeting of the New York Surgical Society. The calices were much distended with pus, and the kidney tissue greatly atrophied. The kidney was drained and a sinus persisted up to the second operation. Up to October, 1906, there remained a dull pain in the right lumbar region, radiating to the right lower quadrant and the inner aspect of the thigh, and increased by movements of the body. About once a week the pain has been more sharp. Frequent micturition has been present, but no gravel has passed. The right kidney is palpable throughout, somewhat enlarged, and not tender. The urine contains much pus, red blood-cells, but no tubercle bacilli. On account of the condition of the right kidney I had about determined to do a right nephrectomy, but the X-ray showed not only a medium-sized calculus in the right kidney, but also several calculi on the left side. Also the ureteral catheterization and the examination of the separate urines showed the right kidney to be functionally more healthy than the left. Hence a right nephrotomy was again done on

November 8, 1906, and a calculus the size of an olive pit and several the size of grape seeds were removed. Two pockets of pus were opened up and the kidney drained.

November 24, the left kidney was noticed to be enlarged and tender, and the patient has complained more and more of left lumbar pain and is losing ground, though she improved for a time after the operation. As this condition did not improve a nephrotomy was done on the left side, December 6, 1906, and three or four calculi, scattered through the pyonephrotic kidney, were removed. As there was an area of fairly normal kidney tissue at one point, though most of it was atrophied or destroyed, no nephrectomy was done. The kidney was drained. For a time there was a profuse discharge of pus, and some urine, from the left kidney. On December 20 it was noted that she voids from 25 to 40 ounces of urine a day with only a trace of albumin, and that the patient's condition was much improved. During convalescence the sinus on the right side closed, but was opened again on January 23, 1907, and two ounces of thick yellowish pus evacuated. On February 11, when she left the hospital, she was fairly strong, and there was only a moderate discharge from the two sinuses.

The bacteriological examinations had showed *Staphylococcus pyogenes aureus* from the two ureters, the right kidney, and the lumbar sinus; and streptococcus from the left kidney. There were no tubercle bacilli. The leucocyte count was 16,400 on November 1 (poly's, 77.5 per cent.), 11,000 on November 12, and 16,600 on November 25.

Though she was relatively greatly improved when she left the hospital she was still very anæmic and weak, though she had no pain. She was cared for partly in the accident ward and partly by a visiting nurse and gradually gained strength so that after a few months she was able to undertake her former housework for her large family. This amount of improvement we hardly expected when she left the hospital, the most that we hoped for was that she would be comparatively comfortable and not a burden to others. Several other cases with a less degree of infection than either of these two cleared up almost at once with the treatment given in all cases, *i.e.*, urotropin, bladder irrigation if necessary, and sometimes bacterial vaccines.

From the last case we see that even in advanced and neglected cases, by conservative treatment, saving the kidney tissue that is left, instead of doing a nephrectomy as the best way to avoid a sinus, we may hope to restore a useful degree of health. This has an important bearing on the question of nephrectomy in the presence of extensive trouble on the other side. By estimating the condition of and the work done by the other kidney, by examining the separate urines, we avoided removing the better of two poor kidneys, where what was left of both was necessary. Of course if the other kidney had been healthy nephrectomy would have been the proper operation.

PROCIDENTIA RECTI; TREATMENT BY EXCISION.

BY JOHN H. CUNNINGHAM, JR., M.D.,

OF BOSTON, MASS.,

Visiting Surgeon to the Long Island Hospital; Third Assistant Visiting Surgeon, Boston City Hospital.

THE object of this communication is not to consider the whole subject of procidentia recti, or complete prolapse of the rectum, nor to detail the different operations which have been employed in attempting to cure the condition. It is the writer's desire to describe a method which he has employed satisfactorily in dealing with procidentia recti in three cases. When the first of these cases presented itself, the text-books dealing with rectal diseases were consulted. It was found that there were several methods from which to choose, as follows: Reduction of the procidentia and constricting the anal aperture by suture placed in different ways by different operators; by cauterizing several longitudinal strips from the base to the apex of the protruding mass; by plastic operations; by elastic ligature; by opening the abdomen, shortening the rectal mesentery, and fastening it to the abdominal wall; by performing abdominal colopexia; and by excising the mass.

The latter method appeared to the writer to be the most practical. The details of the procedure were not found; and as the results obtained by the technic employed have proven more satisfactory than was expected, the steps of the operation are here illustrated and described.

There are certain etiological factors which have a practical bearing upon the success of any operative procedure which attempts to produce a radical cure of procidentia recti. In children the prolapse may be due to straining during urination because of the presence of a congenital urethral stricture or phymosis, or because of the presence of vesical calculus. Such predisposing factors should, of course, receive appropriate treatment before the rectal operation is

undertaken. In the adult the predisposing factors are seldom to be considered, it being the general belief that the presence of the procidentia recti depends upon a loss of tone of the musculature of the pelvic floor (perhaps from childbirth), and from an elongated rectal mesentery.

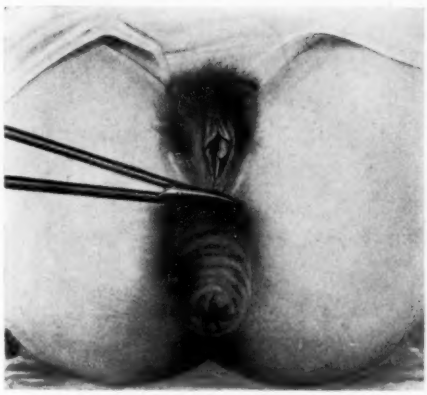
Preparation for the Operation.—If ulcerations exist upon the prolapsed mass, or if the mass is acutely inflamed, treatment should be directed toward the improvement of these conditions before the operation is undertaken. The same is true of foul vaginal secretions and of certain cases of eczema of the buttocks. A light diet and purging of the bowels should be instituted at least two days before the operation, so that the bowel will be free from contents. Just before coming to the operating table, the lower bowel should receive a copious irrigation of 4 per cent. boric acid solution, which should be made to return. The vagina should be flushed in a similar manner.

Operation.—The patient is placed in the lithotomy position, with the buttocks well over the end of the table. The protruding mass and the surrounding parts should be made clean by soap and water and alcohol. The vagina should be packed with sterile gauze.

The protruding mass should be covered with sterile gauze and drawn outward. The rectal sphincters are usually so dilated that they cannot be defined. An incision should be made with a knife at a point three-quarters of an inch from, and parallel with, the anal margin. This incision will usually be beyond the internal sphincter. It should be carried through all the layers of the gut, thus opening into the pocket of peritoneum beneath. A pair of scissors should now be made to continue this incision around the whole circumference of the protruding mass (Fig. 1). The edges should be widely retracted, as a loop of intestine may be within the peritoneal pouch. If so, it should be forced back into the abdomen before the cut is continued.

After this incision is completed, the outer layer of the protruding mass may be rolled inward by pulling the cut edge

FIG. 1.

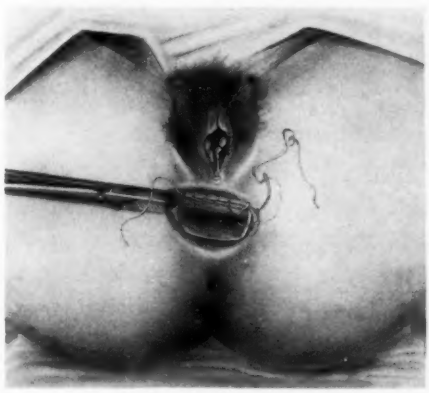


Shows the incision three-quarters of an inch from the anal margin. The scissors are in position to continue the incision around the full circumference of the mass.

FIG. 2.

Shows clamp applied to the gut as high as possible after gut has been drawn taut. The knife is cutting off the gut one-half inch beyond the clamp.

FIG. 3.



Shows the position of the gut distal to the clamp being sutured by a button-hole suture of No. 2 chromic catgut to the border of gut surrounding the anal margin. The end of the suture at the first knot is left long to be tied to the other end of the suture when the anastomosis is complete.

outward and rolling the mucous membrane surface inward, thus doubling the length of the protruding gut (Fig. 2). The gut should be drawn outward until taut, and a clamp with flexible jaws should be placed as high as possible. The hemorrhage from the cut end of the intestine will thus be arrested. The hemorrhage from the cut end of intestine about the anal margin is usually an ooze; if, however, there are bleeding vessels in it, they should be snapped but not tied. The protruding gut should be turned upward and the mesentery of the rectum inspected. Vessels which bleed considerably and which require ligation will usually be found. It is important to control all hemorrhage from the mesentery, as intra-abdominal hemorrhage will otherwise result, following the completion of the operation. The gut having been drawn outward until taut, the clamp having been placed on the gut as high as possible, and the hemorrhage having been controlled, the distal portion of the gut is removed by a knife about one-half inch beyond the clamp (Fig. 2).

It remains now to unite the cut edges of the distal portion of gut beyond the clamp to the proximal portion surrounding the anus. This has been done by a buttonhole stitch of No. 2 chromic catgut, each stitch being made to include at least a quarter of an inch of each cut portion of gut (Fig. 3). This stitch is made to unite all the layers of the cut ends until the clamp is reached. The clamp is then removed and the small space previously occupied by it is included in the sutures. The end of the suture is then tied to the end made by the first knot, and the union is complete. The hemorrhage from the cut gut is controlled by the buttonhole suture.

A piece of rubber tubing four inches long is surrounded by iodoform gauze and made sufficiently large to fill the gut entirely, at the point of suture. This is placed within the gut, its passage being facilitated by smearing it with boric acid ointment. The packing is removed from the vagina and iodoform gauze replaced. A self-retaining catheter may be placed in the bladder and siphon drainage established if it is deemed best. A suitable dressing should be applied to the perineum.

After-treatment.—The patient should be kept on a light diet, and pil. opii, gr. i, should be given night and morning to prevent the bowels from moving. If siphon drainage of the bladder is not employed, the patient should be catheterized at regular intervals for several days. The rectal plug should be left in position for a week, providing the local condition remains satisfactory. After the plug is removed the rectum should be irrigated with 4 per cent. boric acid solution by means of a glass syringe, the amount being never more than 2 oz. at a time for fear of causing a desire to evacuate the fluid. With each injection the fluid should be sucked out. After the bowel is thus cleansed, one-half ounce of iodoform emulsion should be injected and allowed to remain. This procedure should be performed once daily, provided the local condition remains clean. If it is not clean, the procedure should be practiced several times daily. It is desirous to prevent the bowels from moving for ten days unless symptoms arise which necessitate a movement before this time. If so, 4 ounces of oil should be injected into the rectum to soften the fecal masses, and a purge administered. After the movement the iodoform emulsion should be injected.

The patient should remain under observation for a year or two in order to detect any contraction at the point of suture. If this contraction is detected constriction should be dilated by rectal bougies.

Following is a brief account of the cases:

CASE I.—N. C.; aged 58; married; housewife; admitted to the Long Island Hospital November 1, 1907.

Past History.—Never sick or confined to bed except at the birth of her only child. She states that the peritoneum was not torn at that time.

Present Illness.—About one week ago, she was first troubled with what she calls "piles," after having been troubled with constipation for some time. She has no pain or discomfort except at the time of descent of the "piles," at which time there is a constant desire of the bowels to move, strain being severe with no passage of fæces.

Physical Examination.—Fairly well developed and nourished. Nothing abnormal felt except a complete tear of the peritoneum and a prolapse of the rectum.

Local Condition.—The prolapse extends about 3 in. beyond the anal margin. The mucous membrane is swollen, acutely reddened, and furrowed. Both anal sphincters are ruptured in the anterior median line, through the peritoneal body, and into the vagina; the vagina is split on its floor for one inch, either side of the tear being covered with irregular tabs. Because of the tear into the vagina, the prolapse of the rectum occupied the vaginal outlet.

Operation was advised but the patient refused. The parts were kept clean by boric acid irrigation and boric acid ointment. The patient remained in bed most of the time. To sit in a chair or walk was very uncomfortable because the prolapse would return as soon as replaced. The natural tendency of the bowels was to be constipated, and when catharis was employed, incontinence of fæces resulted. Patient experienced so much discomfort that she finally decided to have the operation performed.

Operation, Jan. 21, 1908. The steps of the operation were as already described. In addition to the resection of the rectum, the edges of the tear in the vagina were denuded and united by interrupted silkworm gut sutures, passed deeply so as to include the peritoneal body. At the end of operation about 3 oz. of urine were accidentally forced out of the bladder by pressure in the vagina, the urine flowing over the field of operation. A rubber tube surrounded by iodoform gauze was placed in the rectum and a moist corrosive dressing applied. The patient was given pil. opii, gr. i, night and morning, to prevent the bowels from moving.

Four days after operation the patient passed the tube voluntarily, followed by a small amount of fæces of firm consistency. One ounce of iodoform emulsion was injected into the rectum daily, and the vagina and peritoneum covered with iodoform gauze. Following the passage of the tubing on the fourth day, the pil. opii was omitted and the patient had a movement of the bowels daily without cathartics. When the patient experienced the impulse to defecate, she could control the desire until preparations had been made for its performance, at which time she was able to perform the act in a perfectly normal manner. This control of the bowels continued for three weeks, when she became

constipated and catharsis was instituted. As a result diarrhœa became active, and there was incontinence of fæces. This diarrhœa was controlled with difficulty. When it was checked the incontinence improved and perfect control returned.

Five months after operation the patient was in excellent general condition and most grateful. The continence of fæces continued except when the bowels were loose, at which time there was incontinence. There is no prolapse of the rectum on straining, but the sphincters seem to have but little tone. The repaired vagina and peritoneum remain firm. The finger engages in a cicatricial ring through which it passes with some difficulty and pain, constriction having evidently taken place at the point of suture.

One year after operation the patient remains in good health with no return of the prolapse. The continence of fæces continues except when diarrhœa is present, at which time the control is lost temporarily. Following the detection of the constriction, five months after operation, dilation was practiced once a week for two months. The procedure was so painful to the patient that it was omitted. One year following operation it was found that the constriction had not progressed, the lumen remaining as noted at the time at which the dilatation was omitted.

Case II.—F. T. McC.; female; aged 56; single; cook; admitted to Long Island Hospital for the first time Jan. 8, 1903.

On the above date she was suffering from mitral regurgitation, arteriosclerosis, aortic roughening, hypertrophy of left ventricle, bronchitis, emphysema, and impacted fracture of hip (old). From that time the patient was discharged and readmitted several times, chiefly on account of her cardiac condition.

On July 2, 1907, she returned to the hospital for prolapse of the rectum which she stated had been down for eight days. She had never noticed any trouble with the rectum previously, and her bowels had always been regular when on full diet.

Physical Examination.—Poorly developed and poorly nourished. The same lesions as previously noted were present, the cardiac condition having increased in severity. In addition there was a left inguinal hernia of moderate size. The rectum was prolapsed for a distance of about three inches. The mucous membrane was reddened and œdematous.

During the week following admission the bowels moved only by enema, cathartics having little effect.

Urine.—Pale; slightly alkaline; sp. gr. 1009; albumin, slight trace. No sugar or bile. Sediment shows abundant squamous epithelium; many hyaline casts; numerous large and small round cells: an occasional fine granular cast; triple phosphates.

Operation, Jan. 13, 1908. The steps of the operation were as already described.

Four days after operation the patient passed the plug voluntarily, and had a movement of the bowels, moderate size and of firm consistency.

Fourteen days after operation the temperature began to rise. Patient became stupid and talked incoherently. At this time she began to have incontinence of fæces. Previously it had been possible to control the bowels by pil. opii, gr. i, night and morning. A swelling appeared in the right submaxillary gland, which was tender and gave the patient much pain. One day later the right submaxillary gland became slightly swollen. Patient took nourishment with difficulty. The condition of the rectum at this time showed no prolapse even on straining. The line of suture was evident by an induration about one inch inside of the anal margin. The lumen admitted the index finger easily.

Because of the inability of the patient to take food by mouth nutrient enemata were given, these however were not well retained. The patient's condition gradually became worse. The swelling on both sides of the jaw increased; she failed to respond to stimulation; and died Jan. 13, 1908, seventeen days after operation.

Post-mortem examination showed the rectal condition to be satisfactory in every respect. The immediate cause of death was probably the septic condition of the submaxillary gland, the underlying cause being chiefly the cardiac condition, which has been alluded to.

CASE III.—D. D.; female; aged 49; single; cook; admitted to the Long Island Hospital Sept. 28, 1908.

About a year ago patient began to have pain in abdomen, and soon after passed considerable blood from the rectum. Ever since then, bowels have been irregular: periods of 7 to 8 days of constipation, being followed by diarrhœa. About two months ago rectum prolapsed, and would return immediately when replaced. The condition has been much worse in the past month, and there is considerable abdominal pain and headache.

Examination shows the rectum to be invaginated, and to protrude 4 inches. The mucous membrane on the surface is inflamed, slightly ulcerated in places, thickened, and furrowed. Both the internal and external sphincter are ruptured in the anterior quadrant. The tear involves the floor of the vagina for about two inches, so that the prolapsed rectum occupies the vagina. The cervix is small and the fundus of the uterus could not be determined.

Operation, Oct. 8, 1908. The steps of the operation were as already described. The technic varied from the usual in as much as it was necessary to denude and unite the edges of the tear in the vagina. This could not be perfectly done on account of the thickened inflamed tissues. Some support, however, was given by the vaginal floor overlying the point of union to the sutured gut. An iodoform gauze plug with a rubber tube in the centre was placed through the united gut. An aseptic pad was placed in the perineum, and held in place by a T-bandage. The patient was catheterized every two hours for the first day, but after that she was allowed to void her urine. Liquid diet and pil. opii gr. i was given night and morning to prevent the bowels from moving. The patient pulled the plug out herself two days following the operation, and it was not replaced. The patient also got out of bed repeatedly and removed the dressing many times. Not clear in her mind, yet general condition good. After removal of the tube 1 oz. of iodoform emulsion was injected daily into the rectum after thorough irrigation with a 4 per cent. boric acid solution. The mental symptoms disappeared in about ten days following the operation, and the inflammation about the vagina and anus was greatly improved.

One month after operation the patient was up and about, eating full diet, and greatly pleased with the result of the operation. *Locally,* the tear into the vagina is still present in some degree. There is no protrusion of the rectum. The finger inserted into the rectum shows an indurated area at the line of suture about 1 in. inside the anal margin. The lumen at this point admits the index finger easily. The anal sphincter is apparently functionless.

Four months after operation.—The patient's general condition remains good. She eats everything, and it is strange to say that she does not have continual incontinence of fæces. It is stated by the nurse who has charge of the patient that it is seldom

that the bowels move involuntarily; only in periodical attacks of diarrhœa. This observation has been corroborated by the resident surgeon. The explanation of this favorable outcome is not easy to find, as it is felt that the lacerated anal sphincters no longer serve their purpose of retaining the contents of the lower bowel.

Comment.—The results of these operations have on the whole been most satisfactory. The patients have considered themselves cured of what was a very distressing condition to them.

It is most surprising that continence of fæces has resulted; inasmuch as the sphincters were ruptured in both of the cases which are living to-day. The explanation of this feature is difficult to understand. It may be that the constriction at the site of suture forms a barrier to the passage of the bowel contents until the lower gut has become full or overdistended. Whether or not this is the true explanation, the fact remains.

INTESTINAL ANASTOMOSIS BY INVAGINATION.

BY A. ERNEST MAYLARD, M.B., B.S. (Lond.),

OF GLASGOW,

Surgeon to the Victoria Infirmary, Glasgow; Late Examiner in Surgery to the Victoria University, Manchester, and to the University of Glasgow.

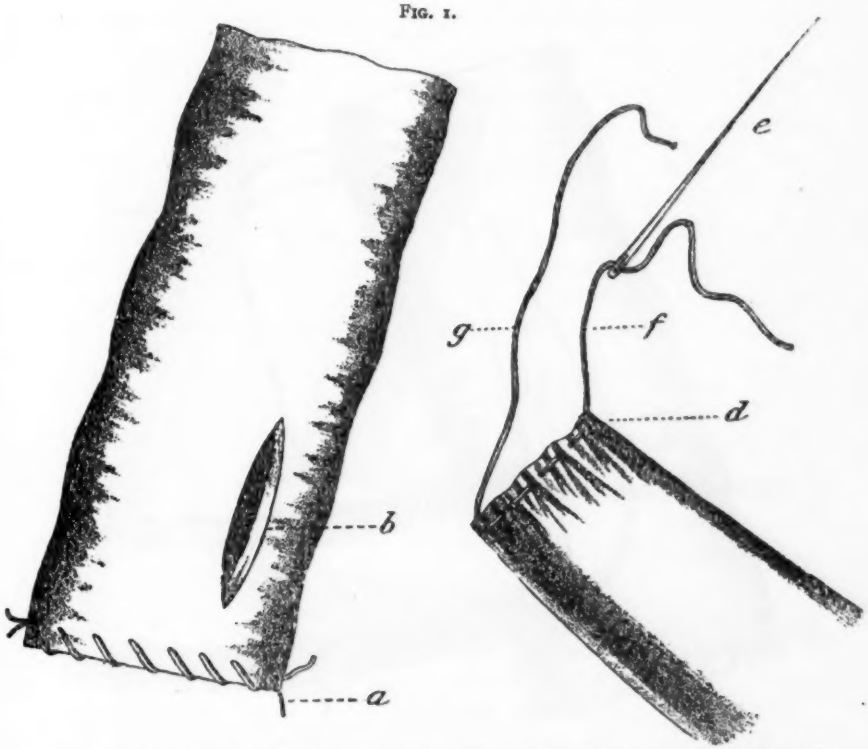
ANY detail in the performance of an operation that will lessen the period of its execution may be justly regarded as a distinct advantage. This reasoning applies, perhaps, with greater force to the abdominal cavity than to any other part of the body; for it is universally conceded that risks of shock and infection bear a direct ratio to the length of time during which the intra-abdominal organs are unnaturally exposed to mechanical or chemical irritation.

The particular detail which it is the object of this short communication to promulgate refers to a simple method of anastomosing one segment of the intestinal canal with another. It was the desire to execute an anastomosis in as short a time as possible that led me to adopt the method in the first instance; and its ease in performance and success induced me to use it subsequently. I have now performed it in four cases, and in each with the result of obtaining perfect union. In two cases, the invagination was of the ileum into the ascending colon; in one, of the ileum into the descending colon; and in one, of the colon into the colon.

A glance at the diagrammatic illustrations will at once make clear the procedure adopted. Suppose the case be one of excision of the cæcum. After removal of the diseased part, the proximal patent end of the ascending colon is stitched up and withdrawn enough to permit a longitudinal incision of sufficient length to be made through the parietes slightly above the occluded end. The length of the incision will be determined by the size of the ileum, which, in cases of obstruction, may be much dilated and hypertrophied. A large-eyed needle threaded with a silk suture about 18 inches in length is car-

ried some three or four times across the patent orifice of the ileum as if to occlude it. The free end of the suture, which was left long, is then passed through the eye of the needle, so that the ileum is now secured as by a sling. The needle is next passed into the colon through the previously made in-

FIG. 1.

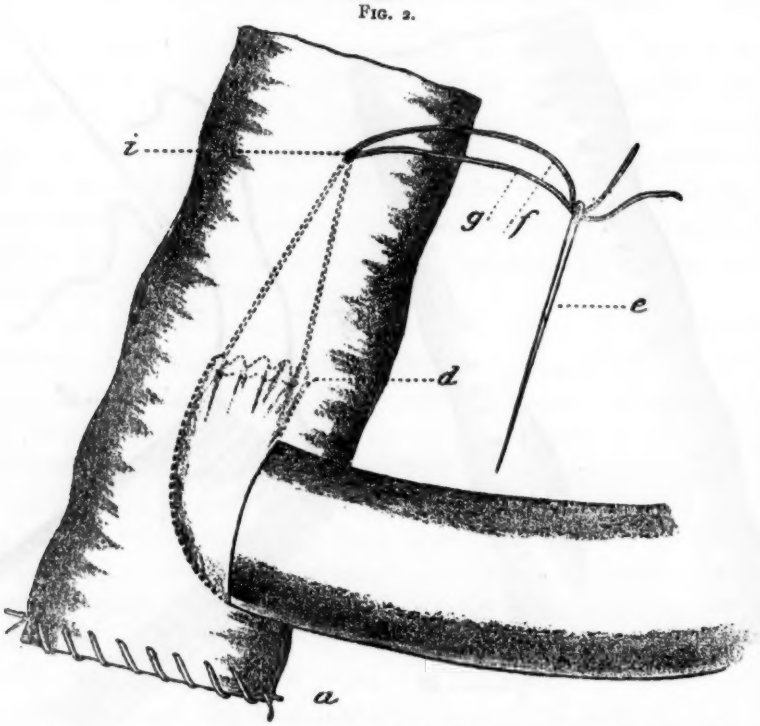


Anastomosis by invagination. 1st stage.—*a*, end of distal segment of bowel occluded by continuous suture; *b*, incision into distal segment; *d*, end of proximal segment of bowel secured with suture, one end of which is left long for rethreading and the other threaded into the needle *e*.

cision, and directed up the intestinal canal for about two inches, when it is made to penetrate the bowel wall from within outwards. By pulling out the needle and consequently dragging upon the sling suture, the ileum is—with the aid of a little guiding—drawn through the incision and made to pass for a short distance along the canal of the colon. While

an assistant keeps tension upon the sling, the operator commences to fix the ileum to the colon by a series of interrupted Lembert sutures passed around the circumference of the opening of the colon. The needle is unthreaded; and by pulling upon one end of the sling suture the other is drawn out of the ileum, the orifice of the latter being thus left free to open

FIG. 2.



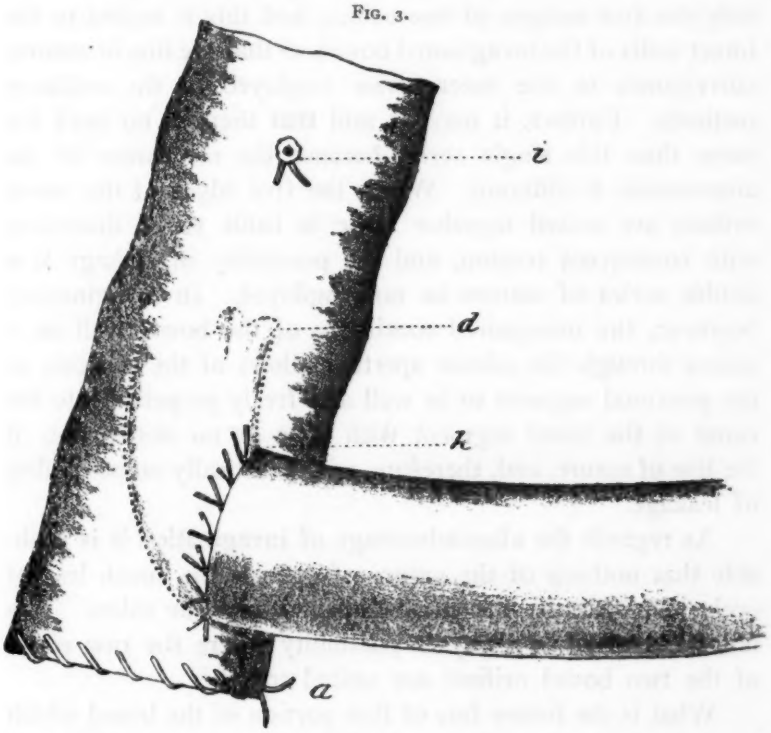
Anastomosis by invagination. 2nd stage.—Shows proximal segment invaginated into distal segment through the opening *b* in Fig. 1, by means of sling suture *g*, *f*. The needle *e* has been made to perforate the bowel at *i* by passing from within outwards.

out. It only remains for security's sake to tie a ligature around the puncture in the colon through which the needle and suture passed.

The last case in which I adopted this method with complete success was that of a woman who had advanced malignant disease of the splenic flexure of the colon, which also invaded the stomach. The patient suffered from obstructive

symptoms; and as removal of the disease was out of the question, I divided the transverse colon just anterior to the disease and planted the patent proximal end into the descending colon. In this instance a small detail in the process of invagination was requisite which it was not necessary to

FIG. 3.



Anastomosis by invagination. 3rd stage.—Shows operation completed. *h*, single circle of interrupted Lembert sutures; *i*, needle puncture surrounded by purse-string suture; *a* and *d*, as in Fig. 1.

execute in planting the ileum into the colon. The mesentery is a thinner and more delicate membrane than the mesocolon, so that it can be sufficiently drawn in when traction is made upon the small bowel. But the comparative bulkiness of the mesocolon necessitates that about an inch or so of this structure be tied off before a sufficient length of bowel can be properly invaginated.

In most methods of anastomosis where the line of union is usually between two raw edges, it is considered advisable, for the sake of absolute security, to employ a double row of sutures—an inner, which unites the free margins of the applied bowel orifices; and an outer, which more or less doubles in and covers the inner series. In the present method there is only the free margin of one orifice, and this is united to the intact walls of the invaginated bowel, so that the line of sutures corresponds to the outer series employed in the ordinary methods. Further, it may be said that there is no need for more than this single series because the mechanics of the anastomosis is different. Where the free edges of the bowel orifices are united together there is liable to be distention with consequent tension, and the possibility of leakage if a double series of sutures be not employed. In invagination, however, the unimpaired continuity of the bowel wall as it passes through the colonic aperture allows of the contents of the proximal segment to be well and freely propelled into the canal of the distal segment with little or no obstruction at the line of suture, and, therefore, with practically no possibility of leakage.

As regards the after-advantage of invagination it is probable that nothing of the nature of contraction, much less of occlusion, will take place at the opening into the colon. This untoward result is always a possibility where the raw edges of the two bowel orifices are united together.

What is the future fate of that portion of the bowel which has been drawn into the canal of the distal segment it is not possible to say. One might conjecture that it would shrink to some extent; and one might still further venture on the assumption that it acted somewhat like a valve, preventing any backward flow or regurgitation from the distal segment into the proximal. If so, then in cases where the cæcum has been excised, the operation artificially reproduces what nature ordained should exist in the form of the ileocæcal valve, but which disease and surgical intervention had removed. The entrance into what may more properly be regarded as specu-

lative considerations concerning the advantages of the method must not blind us to the possibilities of untoward results. Thus the invaginated segment of gut might lead to intussusception, just as is known to happen in cases where there exists a free Meckel's diverticulum. The analogy, however, is not complete; and the risk may be reasonably regarded as too slight in view of the other obvious advantages of the method.

EXCISION OF THE SHOULDER JOINT.

A STUDY OF NINETEEN EXCISIONS OF THE SHOULDER JOINT, LARGELY FROM THE MASSACHUSETTS GENERAL HOSPITAL CLINIC.

BY CHARLES L. SCUDDER, M.D.,

OF BOSTON, MASS.,

Surgeon to the Massachusetts General Hospital; Lecturer on Surgery in the Harvard Medical School,

ASSISTED BY

J. D. BARNEY, M.D.,

Assistant in Anatomy in the Harvard Medical School.

EXCISION of the shoulder joint is not a common operation. No individual surgeon has performed this operation many times. There are comparatively few instances recorded in which the result of an excision is accurately stated, consequently it is difficult to ascertain what the effect of an excision of the shoulder joint really is. Being unable personally to obtain a satisfactory notion of the results following an excision of the shoulder, I undertook the investigation here presented.

In this paper are recorded, (1) the late results of nineteen excisions of the shoulder joint; (2) a case of fracture of the anatomical neck of the humerus with dislocation of the shoulder, in which an excision was done; (3) a case of unoperated irreducible fracture dislocation of the upper end of the humerus. These cases were operated upon by my colleagues (with whose permission they are reported) at the Massachusetts General Hospital and by myself. Dr. Barney rendered great assistance in the collection of data concerning these recorded cases.

To-day it is the so-called simple fracture, the closed fracture, which it is often most difficult to handle.

Excepting skull fractures, in which the conditions are totally different and in which the injury to the bone is of minor consequence as compared with the damage to the underlying brain, the aim of all treatment of fractures is the securing of a firm union, with a minimum deformity and a maximum of mobility in adjoining joints.

Excision of the shoulder may be indicated for, (1) *ankylosis* caused by tuberculosis, by an infectious arthritis, or by a fracture; (2) for a crush of the upper end of the humerus, *i.e.*, a *comminuted fracture;* (3) for an irreducible *dislocation* of the humeral head; (4) for a dislocation of the humeral head *associated with* a fracture of the anatomical neck, surgical neck, or greater tuberosity.

The objects of an excision of the shoulder are, therefore, (*a*) the removal of a tuberculous focus; (*b*) the gaining of mobility at the shoulder; (*c*) the relief of pain.

By an excision of the shoulder is understood ordinarily not the removal of the articular upper end of the humerus and the glenoid surface of the scapula, but the removal of the upper end of the humerus solely. The so-called "excision," therefore, is a partial excision, not a complete excision of the shoulder joint.

The amount of bone removed will, of course, depend upon the exact lesion present. The smaller the amount of bone removed the better. If there is an anatomical-neck fracture with a dislocation, usually it is wise to remove the anatomical head of the bone. If there is a surgical-neck fracture every effort should be made to reduce the displaced head, and then to secure apposition of the fractured bones. The removal of the head and shaft above a surgical-neck fracture may be at times absolutely necessary, but it results in great impairment of motion at the shoulder-joint.

I have to report here the results of excision of the shoulder in nineteen cases. All were subcoracoid dislocations of the shoulder excepting two; one of these was a posterior dislocation and one was a subglenoid dislocation. These cases, coming from one clinic, have been treated under very similar conditions. They are comparable cases. They form a group of very considerable practical importance. The real value of this report will not appear in the general analysis of the cases, but in the careful perusal of the details of each individual case.

The mortality in these nineteen cases is zero. The results obtained in this group, together with those found in the care-

fully analyzed series of cases in literature, consisting of twenty-one excisions,[1] establishes a standard for excisions of this joint in forty comparatively recent cases.

Following the excision of the upper end of the humerus there will be limited power in the shoulder; a distinct diminution in strength; limited active motion in abduction, in adduction, and in anterior and posterior swing; muscular atrophy; possibly the formation of plaques of new bone about the old joint from detached periosteum. These pieces of new bone may seriously impair motion. Deformity and pain may follow an excision of the shoulder-joint.

These nineteen operations were done either immediately after the receipt of the injury or from one to eight months following the injury. Almost always the anterior incision was employed. Many of the results were functionally useful. The surgeon's standard of result is high. The patient's standard of result is relatively low. The surgeon is looking for restoration to the normal, an absolute result. The patient is looking for an amelioration of the disability occasioned by the original accident,—any improvement is, therefore, hailed by him with delight.

It is very generally accepted that the reposition of the head of the dislocated humerus is the ideal treatment for cases of fracture dislocation or of unreduced dislocations, because the reports from such reposition give better functional results than treatment by any other method.

The result following an operative reposition or reduction is better always than the result of an excision. For this reason Curtis has very properly designated (and Mason has lately followed Curtis) the results of reposition as *perfect, good,* and *fair;* while the results of excision of the shoulder are classified as *good, fair, improved* and *bad.* The best excision can only be a *good* result. It is never equal to the *perfect* reposition. The *fair* or second-best excision will be no better than a *good* reposition. This classification of results has been used in applying the cases here reported.

[1] Mason: Annals of Surgery, May, 1908.

In certain cases an arthroplasty of some form may improve the results of simple reposition even beyond what they are at present. The better functional result of operative reposition over excision should induce the surgeon to make every effort at reposition before excising the head of the bone.

I am quite positive that excision is too often done because it is a little easier and quicker than attempts at operative reduction. If one wishes to secure ultimately the best for his patient he will make safe but strenuous efforts to reduce the head of the bone and not to excise it. The too-frequently poor condition following excision emphasizes the importance of this suggestion as to treatment.

An individual unable to put hand to head, unable readily to feed himself, because of limited power in forward swing and abduction—incapacitated for the ordinary acts of life, to say nothing of loss in trade or business—is seriously handicapped. Functionally the result of a dislocated shoulder replaced by manipulation may be serious, of a fracture dislocation of the shoulder replaced by incision may be much more serious, of a fracture dislocation excised may be most serious.

About 59 per cent. of these cases had fair results. I am impressed by the disability following excision of the shoulder.

The farther away from the joint the fracture occurs, *i.e.*, the nearer the fracture is to the shaft, the greater is the likelihood of being able to reduce the displaced head by hook, by digital pressure, by periosteum elevator or by blunt dissector leverage. Every reasonable effort should be made to secure an ideal result. Reposition is ideal. Excision at best is but second best.

ABSTRACTS FROM RECORDS OF NINETEEN CASES OF EXCISION OF THE SHOULDER-JOINT.

CASE I.—*Fracture dislocation of the humeral head. Excision of the shoulder.* Report after two and a half years.

O. H. P. No. 133599. A man 49 years old, a policeman, fell from a team and received a dislocation of the humeral head and a fracture of the shaft through the greater tuberosity and anatomical neck. The greater tuberosity remains attached to the lower or shaft fragment.

August 19, 1903, excision of the head of the humerus. Removal of a little of the upper end of the shaft of the humerus.

The report two and a half years after the operation declares that for one year following the operation there was soreness in the shoulder, especially after much use of it. He cannot get it up as high as the well arm. He has not great strength in the reaching movements. There is slight atrophy of the supra- and infra-spinati. The movements of the shoulder are assisted by the scapula group of muscles. The symmetry of the shoulder is well preserved. The movements are definitely limited by the impinging of the upper end of the humerus upon the scapula. He touches the opposite shoulder with slight effort. He carries the hand behind the back to the sacrum with effort.

CASE II.—*Fracture dislocation of humeral head. Fracture of surgical neck. Excision of shoulder.* Report two and a half years after operation.

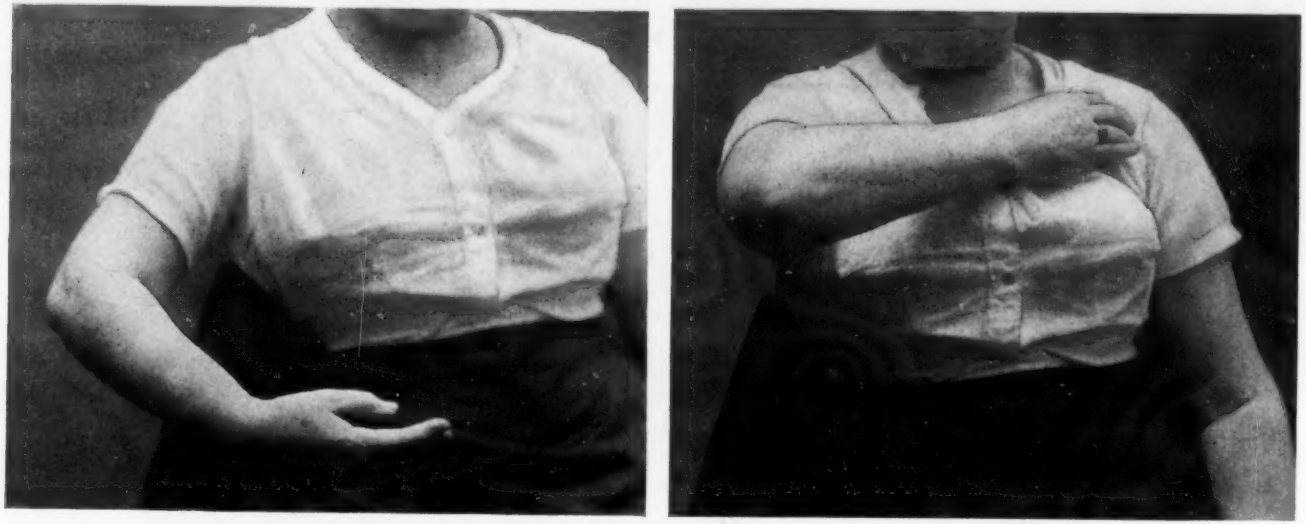
E. F. No. 128440. A female, 61 years old, doing housework, received a subcoracoid dislocation of the right humerus, August 8, 1902. Seven weeks after the accident an unsuccessful attempt at reduction was made. After this attempt at reduction an X-ray discovered a fracture of the surgical neck of the humerus with a subcoracoid displacement of the head of the bone. Nine weeks after the accident, an excision of the head of the bone was done through an anterior incision. The wound was drained.

Two and a half years following the excision of the shoulder, examination finds: Abduction is possible with the assistance of the scapula muscles to beyond a right angle. She can almost put her right hand behind her back. She can touch the left shoulder. She can put her right hand to the side of her head. The upper right arm is shorter than the left. There is no marked atrophy. She cannot comb her hair with the right hand nor can she button her clothes behind her waist. The arm troubles her little, excepting occasionally because of rheumatism in the shoulder. She does her own housework.

CASE III.—*Dislocation with fracture of the surgical neck and of the greater tuberosity of the humerus. Excision of the head of the humerus.* Report nine years after operation.

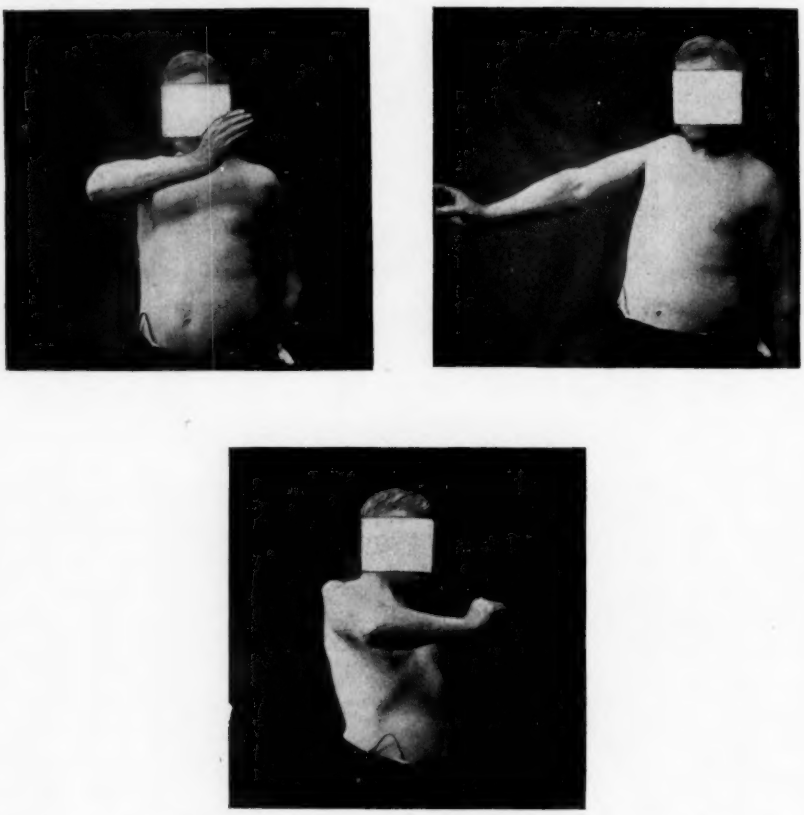
C. A. C. No. 105090. A female, 56 years old, doing housework, had fallen, receiving a dislocation fracture of the greater tuberosity and transverse surgical neck seven weeks previously.

FIG. 1.



CASE III.—Fracture dislocation of the right shoulder. Excision. Condition nine years after operation.

FIG. 2.

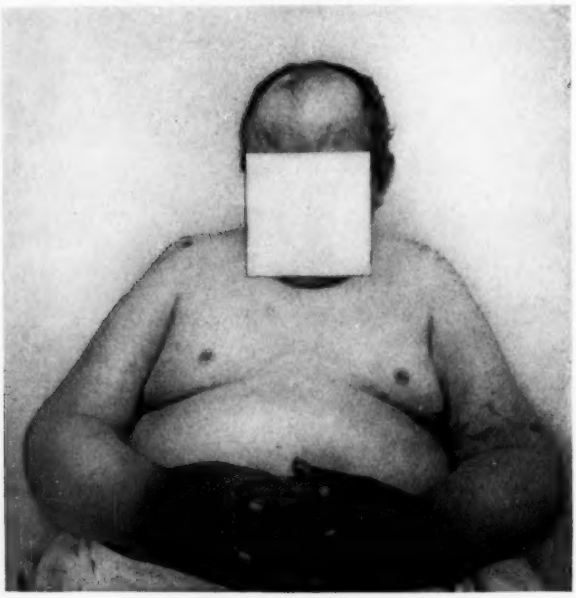


CASE IV.—Fracture dislocation of the right shoulder. Excision. Condition eight years subsequently.

FIG. 3.

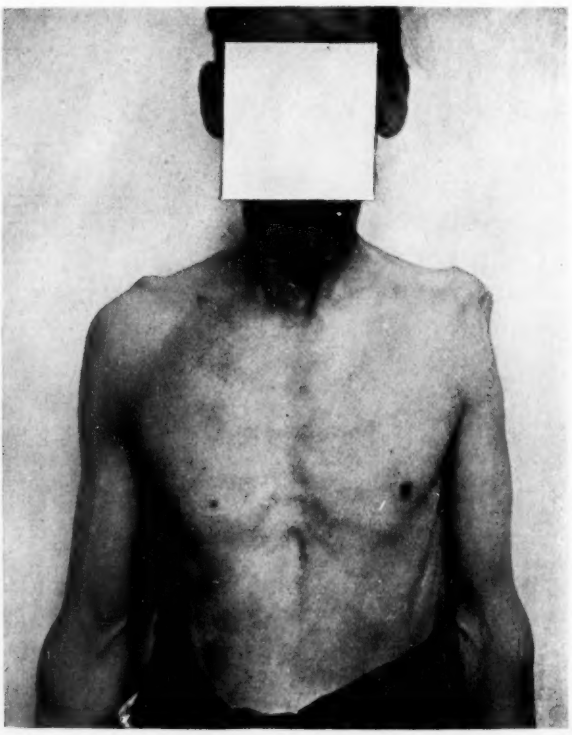
X-ray appearance following some time after an excision of the shoulder for trauma. Note the plaques of new bone formed above the end of the shaft.

FIG. 4.



CASE. VI.—Dislocation of both shoulders. Excision of head of each humerus. Result seen in photograph after operation. (C. B. Porter, M. D.)

FIG. 5.



CASE VII.—Fracture dislocation of the left shoulder. Excision of the head of the humerus. Result nine years later. Note the atrophy of the deltoid in the left side. Note the deformity of the shoulder region.

Attempts at reduction were followed by a refracture of the greater tuberosity and no reduction of the head of the humerus.

October, 1897, an excision of the head of the bone was done. Drainage.

Report nine years after operation (see Fig. 1). She cannot raise her hand above the nose. She cannot put her arm far forward. She can touch the opposite shoulder. The backward swing is lost. She can play the piano.

CASE IV.—*Fracture dislocation of the right shoulder. Excision of humeral head.* Report eight years after operation.

S. F. H. No. 104073. Dentist. A man, 64 years old. Eight weeks before he had received through a fall a fracture of the humerus and a dislocation of the head of the bone. Excision of the head of the humerus was done. The wound was drained.

Eight years subsequently the following report is received (see Fig. 2). He is able to do a great deal of work with the arm. He can put the index finger to the lobe of the ear. He cannot feed himself with that hand. He has little trouble excepting some rheumatism at times.

CASE V.—*Fracture dislocation of the right shoulder. Excision of the head of the humerus.* Report eight years later.

M. R. No. 109981. Machinist. A man 44 years old. Fell five and a half weeks previously, dislocating the right shoulder and fracturing the greater tuberosity. He complained of pain and disability. An excision of the head of the humerus was done.

Eight years later the man was in excellent health. He says "the operation was a success." He cannot raise his hand as high as before he met with the accident. "I am doing my old work. I am not troubled by my shoulder" (see Fig. 3).

CASE VI.—*Dislocation of both shoulders. Excision of the head of each humerus.* Result one year and four months later.

J. P. C. No. 129354. A man 48 years old, a barkeeper. One month ago he fell down stairs and dislocated both shoulders. He has little or no pain. Abduction and adduction are absent. He has little rotation at the shoulders. October 11, 1902, the head of the right humerus was excised. October 29, 1902, the head of the left humerus was excised. An external incision was used in each instance.

Examination one year after operation: left arm, good antero-posterior motion; can get hand to face; abduction 45°; ankylosis pretty evidently periarticular; a good grip; no rotation is possible.

Right arm, abduction 15°; no rotation; a weak grip; arm of no use whatsoever (see Fig. 4).

In March, 1904, he died. "The operations were a success in that he could help himself." He could not raise his arms on a line with his shoulders. He could not place his hands upon the top of his head without bending head down on his chest. He had no pain.

CASE VII.—*Fracture dislocation of the left shoulder. Excision of the head of the humerus.* Result nine years later.

A. F. P. No. 105896. A man 48 years old, a sailor. Following a violent blow upon the left shoulder two months ago a fracture of the anatomical neck together with a dislocation resulted. All motions of the shoulder were much limited and painful.

An excision of the head of the bone was done with difficulty. The chisel was needed to free the bone completely. Many periarticular adhesions were divided.

Nine years later he reports that he is able to work every day. The arm bothers him very little. He cannot put his right hand upon his head, but he can put on and take off his hat with his right hand. He says his arm is as good as he can expect.

Ten years later he can place hand on neck but not on shoulder. He can move arm in abduction 45°. He can put hand behind back (see Fig. 5).

CASE VIII.—*Dislocation of the right shoulder. Excision of the head of the humerus.* Report four months after operation

J. F. F. No. 144230. Male. A teamster 38 years old. It was impossible to obtain a history of trauma. The head of the humerus was displaced upward and backward. September 9, 1905, an excision of the head of the humerus was done to relieve his disability. The anterior incision had been employed.

Four months after operation examination finds that he has changed his occupation from teamster to night watchman. He found that he could not put a harness on a horse. There is not much ankylosis, but the loss of motion seems to be because of loss of muscular attachment of the bone. Atrophy of all the muscles of this shoulder group. He can put his hand to his head, mouth, and behind his back. He cannot abduct more than 20° without using the scapula muscles. He has more or less pain on motion and is unable to sleep on that side.

For some reason the elbow was immobilized for several

weeks after the operation by a Velpeau bandage so that it became stiff. It required some time to secure motion again.

CASE IX.—*Fracture of the anatomical neck of the right humerus with dislocation of the shoulder. Excision of the head of the humerus.* Report after nine months.

G. A. (Private case.) Man. Clerk 31 years old. Fell and sustained a subcoracoid dislocation of the right humerus six weeks previously. Because of a fracture of the anatomical neck of the humerus it was impossible to reduce the dislocation. Consequently an excision of the head of the bone was performed, through the anterior incision.

Nine months later he has fair use of the arm. All attempts at abduction are associated with movements of the scapula (see Figs. 6 and 7).

CASE X.—*Tuberculosis of the shoulder. Excision.* Report twelve years after operation.

M. V. Thirty-four years old. For some years has had trouble with the shoulder. Curettage has been employed many times. She recovered after operation for excision of the shoulder and is living twelve years subsequently. She is a feeble person. All the motions at the shoulder-joint are much limited. The amount of abduction possible is seen in the photograph (see Fig. 8).

CASE XI.—*Tuberculosis of the shoulder. Excision.* Report nine years after operation.

M. Thirty years old. Had had trouble for three years. Many abscesses and sinuses. At operation the head of the bone was excised. Patient recovered and is now living, nine years after operation. There is a sinus discharging occasionally. He is able to work. He can put his hand to his face. He cannot place his hand on the top of his head. He is able to shovel 12 tons of coal a day. He can lift 200 pounds off the ground, using both arms.

CASE XII.—*Tuberculosis of the shoulder. Excision.* Report one year and six months after operation.

J. P. Twenty-two years old. Machinist. Had had trouble for five years. At the operation the joint was found thoroughly disorganized. Patient recovered and is living one year and more since the operation. Has a small sinus.

One year and a half after operation abduction is to 45°. Forward swing is slight. Backward swing is normal. Abduc-

tion normal. There is no obstructing bone. Rotation outward is limited. There is an open sinus which discharges a little (see Fig. 9).

CASE XIII.—*Tuberculosis of the shoulder. Excision.* Result two years after operation.

M. Fourteen years old. Has complained of trouble for three months. The head of the bone was found much eroded at operation. The patient recovered with good result.

Two years after operation there is very little impairment of motion in any direction. Patient is in good health (see Fig. 10).

A group of cases follows in which the estimate of the result of excision is modified by conditions present previous to operation.

CASE XIV.—*Subcoracoid dislocation of the humerus with laceration of the forearm and elbow. Amputation of upper arm. Excision of shoulder.* Result two years subsequently.

F. A. P. No. 139377. Male. Forty-seven years old. Was run over in July, 1894. The arm was amputated eight inches from the shoulder. A subcoracoid dislocation existed upon the same side, but was not reduced. There has been pain and disability in the stump ever since that time. October, 1904, an excision of the head of the humerus was done for relief of pain.

A report of the present condition, made November, 1906, two years after the operation, declares the arm now to be free from pain, although, of course, the stump is of little use.

CASE XV.—*Subcoracoid dislocation of the left humerus with fracture of the greater tuberosity and fracture through the anatomical neck. Excision of the shoulder.* Result six months later.

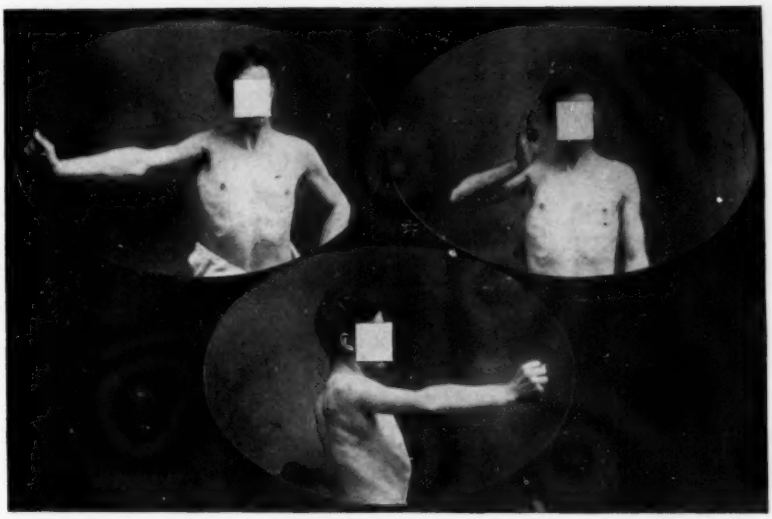
M. F. W. No. 133992. Male, 64 years old. Gave a story of a fall upon the left shoulder five weeks previous to September 8, 1903. Attempts at reduction of the dislocation were ineffective.

September 11, 1903. The head of the humerus was excised by the anterior incision. The patient made a good recovery from the operation and was gaining the use of the arm when he left the hospital.

Report comes that he died six months later from some other difficulty.

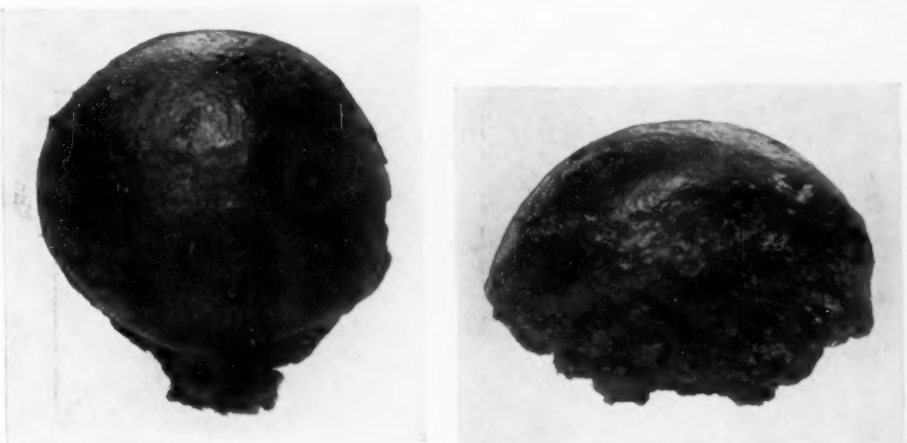
CASE XVI.—*Subcoracoid dislocation of the humerus. Excision of the shoulder. Relieved of pain. Death one year later.*

FIG. 6.



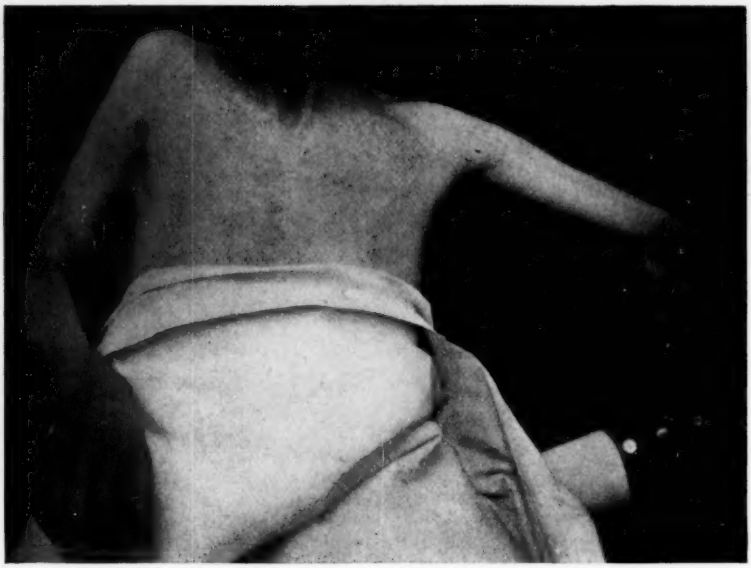
CASE IX.—Fracture of the anatomical neck of the humerus. Excision of the head of the bone. Result nine months later (see Fig. 7).

FIG. 7.



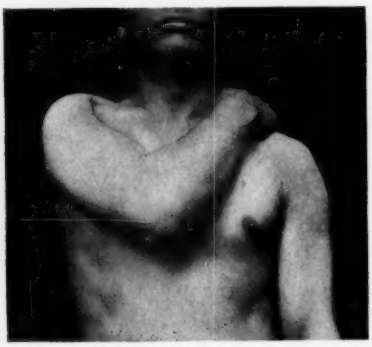
Anatomical neck fractured in Case IX of this series. This is the head of the bone removed (see Fig. 6).

FIG. 8.



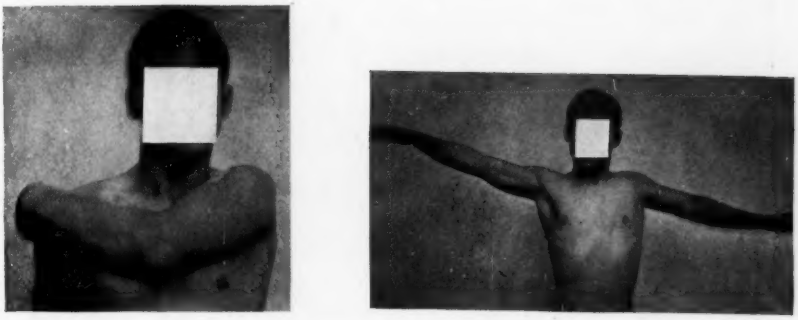
CASE X.—Tuberculosis of the shoulder. Excision. Condition twelve years after operation.

FIG. 9.



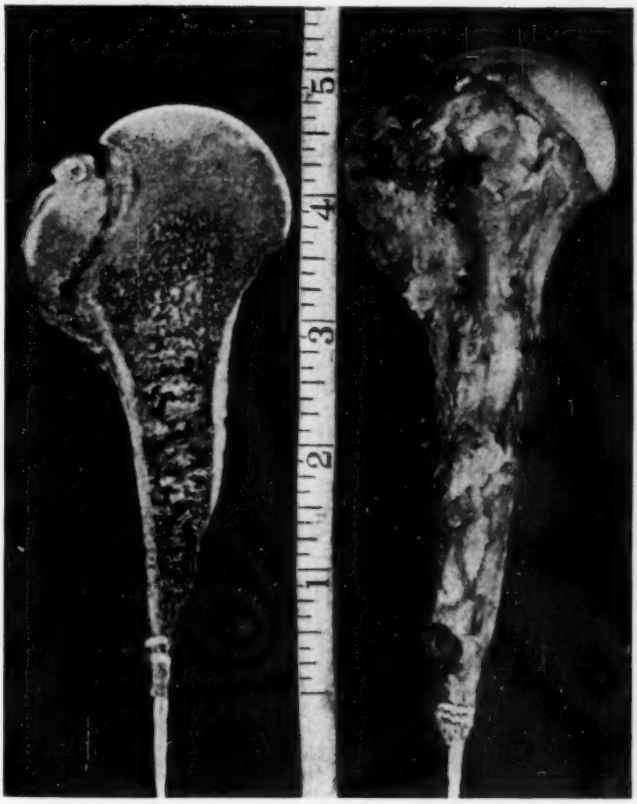
CASE XII.—Tuberculosis of shoulder. Excision. Condition one year and six months after operation.

FIG. 10



CASE XIII.—J. H. Tuberculosis of shoulder joint. Excision. Result two years after operation.

FIG. 11.



CASE XVII.—E. H. Showing the portion of bone removed. A fracture of the greater tuberosity and of the low surgical neck.

FIG. 12.

CASE XIX.—Irreducible fracture dislocation of the left shoulder, unoperated upon. Condition six years after operation (see X-ray plate, Fig. 13).

FIG. 13.

CASE XIX.—X-ray of Case XIX, showing fracture dislocation of the humeral head. Note greater tuberosity fractured. Note loss of contour of end of the bone. Six years since accident.

J. C. No. 115494. A woman 61 years old fell and injured the shoulder six months previously. Reduction of the subcoracoid dislocation of the shoulder was impossible even under an anæsthetic. The head of the humerus was excised. Before leaving the hospital about three weeks after the operation the pain had been relieved and there was some excursion of the shoulder when actively used.

She died one year after operation from extensive burns of the body.

CASE XVII.—*Subcoracoid dislocation of the humerus with fracture of the greater tuberosity and of the surgical neck. Excision of the shoulder. Relieved of pain. Death three years subsequently.*

E. H. No. 110942. A woman 53 years old fell two and a half months previously, sustaining a subcoracoid dislocation of the humerus together with a fracture of the greater tuberosity. During an attempt at reduction of the dislocation the shaft of the humerus was fractured at the surgical neck. She suffered great pain in the injured shoulder.

At the operation by an anterior incision the head of the humerus was excised. She was completely relieved of the pain by the operation.

Three years subsequently she died of "progressive muscular atrophy" (see Fig. 11).

CASE XVIII.—*Subcoracoid dislocation of the left shoulder. Resection of the head of the bone.* Result eleven years later.

J. G. No. 97424. A male 63 years old. Eight months previous to operation fell and dislocated his left shoulder (subcoracoid). He had pain and disability. Considerable muscular atrophy. The fingers were permanently flexed.

November, 1895, an excision of the head of the bone was done. Drainage. Anterior incision. Adhesions in fingers broken up forcibly.

Eleven years later: He cannot put his hand upon his head. He can touch the opposite shoulder. The fingers are very stiff and crooked. The whole upper extremity is of little use to him, practically useless.

CASE XIX. (Private.) Man.—*Dislocation fracture of the left shoulder. Irreducible. Unreduced. No operation done. Result* six years after the accident.

The patient is able to put the left hand upon the top of his

head without bending the head more than a trifle. He cannot quite place the left hand squarely upon the right shoulder. He can place the left hand behind his back but a little less than the right hand.

He can raise his left arm to a horizontal in the forward swing. He can abduct the left arm slightly beyond a right angle.

There is a little difference in his reach, the left arm being slightly shorter than the right. The left arm hangs away from the side further than the right. The back of the left hand faces forward.

He has some discomfort at times because of a little "catching," as he expresses it, in the left shoulder. The left arm gets a little more tired at times (see Figs. 12 and 13).

Remarks on Case XIX.—I wish to place upon record this case of unreduced and unoperated fracture dislocation of the shoulder. It is a most interesting and unusual case. The patient was an adult, a superintendent in a brewery. Six years ago he fell, dislocating the left shoulder, fracturing at the time the greater tuberosity of the humerus (see X-ray figure). To-day, six years after the injury, he has recovered, with a remarkably useful shoulder. The extent (see Fig. 12) of the movements at the shoulder-joint is best seen in the photographs. He complains only that the arm becomes a little tired after some hours' walking about. It seems to him less well supported at the shoulder than the other arm. Resting the hand in the coat for a few moments relieves him of this tired feeling.

Other similar cases have been recorded. The results in certain of unoperated and unreduced dislocations are as good as in some excisions of the shoulder and are often better than in many excisions of the shoulder. The results in these cases are certainly suggestive.

If reposition by manipulation or incision is impossible, and there is no pain for which excision is demanded, it may be wise in a certain very limited class of cases to avoid an excision of the head of the bone. Certain it is that in a few irreducible cases of dislocation of the upper end of the humerus a remarkably good result has followed without excision.

TRANSACTIONS

OF THE

NEW YORK SURGICAL SOCIETY.

Stated Meeting, February 10, 1909.

The President, Dr. Joseph A. Blake, in the Chair.

TREPHINING FOR JACKSONIAN EPILEPSY.

Dr. Otto G. T. Kiliani presented a man, twenty-four years of age, who twenty-two years ago sustained an injury, receiving a compound fracture in the left frontal region. He subsequently developed frequent attacks of epilepsy of the Jacksonian type, for the relief of which he was referred to Dr. Kiliani, who trephined the skull on January 7, 1909.

The operation was done with the aid of the Borchardt-Sudek fraze, slightly modified by Dr. Kiliani. By this method, which he demonstrated, the skull was entered more rapidly and with less violence than by the Gigli saw or any other method with which he was acquainted, and he now employed it to the exclusion of all other methods. In the case presented, the patient showed absolute freedom from shock, which was usually so pronounced after other methods of opening the skull. Upon exposing the dura it was found whitened and adherent. Multiple needle punctures failed to reveal the presence of an abscess. The dura was thereupon resected and the resulting gap covered with a layer of thin silver film, which was left *in situ*. The patient was able to leave the hospital two weeks after the operation. He had had two or three epileptic seizures since the operation, which had been done so recently that its final outcome was still in doubt. The case was shown chiefly to demonstrate the Borchardt-Sudek method of entering the skull, and the ease with which it could be accomplished.

EXCLUSION OF COLON FOR NEW GROWTH.

DR. JOSEPH A. BLAKE presented a man, 45 years old, who entered Roosevelt Hospital on November 11, 1908, suffering from a suppurating adenocarcinoma of the descending colon, and partial obstruction. At operation, on the following day, the abscess was incised, and a part of its wall, which was adherent to the abdominal paries, was removed for microscopical examination. The abscess contained several ounces of foul-smelling pus suggesting connection with the intestine, and it was thought at the time that a fistula would result; but this did not occur and the wound gradually healed. The examination of the piece removed proved it to be adenocarcinoma.

The symptoms of obstruction increased and on December 1 became urgent. On this day, through a median incision, the ileum was divided about six inches from the ileocæcal valve and the oral end implanted by means of a Murphy button into the side of the sigmoid flexure of the colon below the growth, which was widely adherent and apparently irremovable. The aboral end of the ileum was brought out of the upper end of the abdominal incision; the clamp used to occlude it, being left on, retained it in place. The wound was closed without drainage and healed by first intention.

The convalescence was exceedingly stormy. For six days, the picture was that of gastromesenteric ileus or obstruction high in the small intestine. Lavage was practised several times daily during this period. The patient's condition was so bad that reopening the wound to find the cause was only thought of to be abandoned. During all this time, gas and fæces were obtained from the rectum in response to irrigations. The colon above the obstruction was washed out every three hours through the end of the ileum lying in the wound, and water and predigested foods were introduced. At the end of a week, the ileus disappeared, and the patient was discharged on Dec. 20, nineteen days after the second operation. The bowels are now acting normally and regularly.

The operation has several features to recommend its employment in irremovable growths above the pelvic colon. It avoids establishment of an artificial anus, with its attendant discomforts; and, if there is any chance of removing the growth, it can be done later with a free hand without the necessity of making

an anastomosis. It is also available for exclusion of the intestine in ulcerative colitis and possibly in pernicious anæmia, if, as some believe, the latter may be caused by intestinal toxæmia. It is safer than excision of the entire colon, and may be used as a substitute for that operation where removal of the colon is not absolutely indicated. It can hardly be recommended for constipation, since it is a somewhat difficult operation and must be attended with considerable danger.

Since operating upon this patient, Dr. Blake said he had done the same operation for the same condition in another patient with equally good results.

EXTENSIVE PERITONITIS.

Dr. John Rogers presented a woman, 21 years old, who, when she was admitted to Gouverneur Hospital, had a temperature of 103° and a pulse of 120, with symptoms pointing to a kidney infection. The kidney was exposed with negative results, and when Dr. Rogers came on service and first saw the patient she was apparently convalescing. Suddenly, about two weeks after the exposure of the kidney, his attention was called to the patient by the nurse. An examination showed evidence of an extensive peritonitis, which had apparently existed about twelve hours. On opening the abdomen, he found a great deal of free pus, with extensive peritonitis. This apparently originated in a ruptured retrocolic abscess connected with the appendix, and the presumption was that the woman's original attack was one of appendicitis from which she was recovering when this secondary attack occurred.

After flushing out the abdomen, Dr. Rogers said he made an attempt to remove the appendix, but did not persist on account of its retrocolic location. Then, through a rubber catheter, which was passed in various directions in the abdominal cavity, he injected two ounces of lactic-acid bacilli, as prepared under the direction of Dr. Chas. E. North. The abdomen was then entirely closed. Within twelve hours the patient's temperature dropped from 103° to 99°; and although she was much prostrated, the case progressed favorably until two weeks later, when she had a secondary collection of pus in the opposite side of the abdomen. This was opened and drained, and the further recovery of the patient was uneventful.

Dr. Rogers said he did not wish to be understood as attributing the recovery of this patient to the lactic-acid bacilli, which he had now used in two or three other cases with apparently beneficial results. Still, he was not yet convinced of the efficacy of the treatment and presented the case chiefly as an example of the entire harmlessness and apparent beneficence in this use of the lactic-acid bacilli.

BLADDER CALCULUS.

Dr. Ellsworth Eliot, Jr., presented a woman, 60 years old, who was admitted to the Presbyterian Hospital in December, 1908, with the following history: About a year ago, without assignable cause, she developed some bladder trouble which manifested itself in pain over the bladder region and in the urethra during micturition. This pain was well localized and not intense. It came on sometimes before, sometimes after, and sometimes during micturition. The urine was voided in small quantities eight or twelve times daily, and was fairly clear. She stated that about six months prior to her admission she had been operated on at St. Vincent's Hospital for some obscure pelvic lesion, and since that time the bladder and urethral symptoms seemed to have become more severe.

For two weeks prior to her admission to the Presbyterian Hospital she had suffered from chilly sensations. The urine was cloudy and had a strong odor, and at times contained small quantities of blood. There was no history of gravel, no interruption of the stream, no dribbling.

An examination of the bladder with the searcher showed the presence of a calculus. This had been previously revealed by an X-ray, which in addition to the shadow above the pubes showed a second shadow near the spine of the ischium. The question naturally arose whether the stone in the bladder was the only stone, or whether there was also a stone in the ureter. Through a suprapubic incision, the lateral wall of the bladder was exposed, but owing to the large amount of fat, the vesical end of the ureter could not be satisfactorily reached. The peritoneal cavity was therefore opened, and the ureter followed down from its crossing of the external iliac to the bladder. Simultaneously, and with a finger in the peritoneal cavity as a guide, the extraperitoneal incision was deepened to the junction of ureter and bladder. In spite of a very thorough manipulation, no ureteral

calculus could be detected, neither was there any dilatation of the ureter. The peritoneal cavity was then sutured and closed and the bladder opened above the pubis and the calculus removed. A soft catheter was left in the bladder for four days after the operation. The patient made an uneventful recovery. Her urine cleared up, and the pain and frequency disappeared.

An X-ray taken subsequent to the operation showed no vesical shadow, but still showed the shadow near the spine of the ischium which had been taken for a ureteral calculus. Dr. Eliot said he had seen similar shadows in a number of instances in patients who were X-rayed for other purposes. They were not as a rule in the line of the ureter, but occasionally so close to it that one could be easily misled. In the case in question he was convinced that the second shadow was not a ureteral calculus, but was due to slight thickening of that particular part of the pelvic bone or to some osseous focus in a pelvic ligament.

RUPTURED SPLEEN; SPLENECTOMY.

Dr. Ellsworth Eliot, Jr., presented a man, 45 years old, who was brought to the Presbyterian Hospital in December, 1908, with the history of having been run over by a truck. On his arrival at the hospital, at 11 o'clock in the morning, his pulse and temperature were normal, and with the exception of a slight superficial abrasion over the left flank, he was apparently uninjured. He was carefully watched, however, his pulse being taken every fifteen minutes. For the first two hours after admission, it ranged about 80; then it gradually began to increase in frequency; and at the end of the third hour it had reached 90, and two hours later 100. The patient complained of very little pain; there was no vomiting nor shock.

About five hours after admission, with the pulse still increasing in frequency, the patient began to complain of acute pain; and there were rigidity and incipient dulness in the left flank. He was etherized, and an incision was made parallel with the costal margin. There was considerable free blood in the peritoneal cavity; and upon exposing the spleen, it was found to be almost bisected and bleeding. Its pedicle was seized with a clamp and ligated, and the spleen removed. The peritoneal cavity was then washed out, and a small counteropening made for drainage. The patient made an uneventful recovery. Dr. Eliot said that in this

case, as in several others of rupture of the spleen that he had seen, the spleen was anchored by old adhesions; and this he thought might be a factor in the rupture of this usually mobile organ.

The operation was followed by changes in the blood similar to those reported by the author in other cases of traumatic rupture of the spleen. There has been at no time any anæmic cachexia, nor evidence of thyroid or glandular enlargement.

Apart from this man's splenectomy wound, he showed the scar of an operation for hare-lip which had been done by the elder Gross in Philadelphia more than 40 years ago.

Dr. F. W. Murray recalled a case of splenectomy for pistol-shot wound in which the symptoms of internal hemorrhage came on gradually and in which an incision similar to the one used by Dr. Eliot gave satisfactory access to the spleen. The general condition of the patient on admission was fair, and some pain on pressure below the left costal arch was noted. The entire abdominal wall was exceedingly rigid and suggested damage of the abdominal contents. The bullet entered the left side of the back and could be felt in the eighth or ninth intercostal space. After six hours' observation it was decided to operate, as it was evident that there was internal hemorrhage. The bullet was removed through a small incision parallel with and at the edge of the costal arch. Through an incision at the outer edge of the rectus and extending from the sternum to the level of the umbilicus the abdomen was opened and it was seen that there was hemorrhage from the spleen. The first incision was then prolonged upwards and inwards along the edge of the left costal arch up to the beginning of the second incision. The triangular flap thus formed was retracted downwards and outwards and a satisfactory approach to the spleen resulted. The spleen was removed, as it was almost bisected by the bullet, and an uneventful recovery followed the operation.

Dr. L. W. Hotchkiss said he had previously reported three cases of rupture of the spleen. In all of these cases, the spleen was removed either through a median or left median incision.

FRACTURE OF THE EXTERNAL CONDYLE OF THE HUMERUS.

Dr. Frank S. Mathews presented a boy, 8 years old, who was brought to St. Mary's Hospital for Children last summer with a fracture of the external condyle of the left humerus. He was

seen by the house surgeon, who was unable to effect reduction. The next morning, under ether, Dr. Mathews made an incision over the elbow and found that the fractured surface had been rotated outwards so that it lay immediately underneath the skin, while the articular surface of the fragment was in contact with the fractured surface of the humerus. The fragment had emerged through a rent in muscle and fascia to its position under the skin. It was this fascia which formed the barrier to reduction. Dr. Mathews had seen another patient with this accident two months after injury where there was non-union and the removal of the fragment was necessary. In the present case when the rent in the soft parts was retracted the fragment sprung back into place. The further course of the case was uneventful, and the functional result was practically perfect.

Dr. Gibson said he had seen a somewhat analogous condition in a fracture of the lower end of the femur in which there was a complete rotation of 180 degrees of the fragment. In this case the injury was the result of getting the leg caught in a hawser.

NEPHROTOMY AND URETERAL OBSTRUCTION.

Dr. Frank S. Mathews presented a boy, 7 years old, who was admitted to St. Mary's Hospital for Children, in the service of Dr. Dowd, about two years ago, with symptoms of appendicitis. Upon opening the abdomen, a small discrete abscess was found in the right iliac fossa; this was evacuated, the appendix was removed, and the wound healed promptly.

Before he was able to leave the hospital, he began to complain of an occasional stomach-ache; and about three weeks after the operation blood was temporarily found in the urine. He then began to have pain located in the left side. His temperature, which had fallen to normal, again became elevated, and there was abdominal rigidity. An X-ray was taken, with negative results. A second operation was thereupon decided on. On the night preceding this he had two convulsions, and his abdominal pain was intense, in spite of very large doses of chloral and morphine, and inhalations of chloroform and ether administered by the house surgeon.

On the following morning, under ether, the left kidney was found to be considerably enlarged. An incision was made over it, and the kidney was easily delivered through the wound. As

this was done, the pelvis of the kidney ruptured, and there was a discharge of bloody urine. As this seemingly pointed to an obstruction lower down, a bougie was passed into the ureter as far down as the pelvic brim, where it apparently became obstructed. The nozzle of a small irrigator was then inserted into the ureter, and an attempt was made to introduce fluid into the bladder in this way; but this also proved unsuccessful. An incision as for the ligation of the external iliac artery was then made, and through this the ureter was examined, but nothing abnormal was found. The kidney was thereupon replaced, and the wound closed with a small cigarette drain. The boy made an excellent recovery. He had no further pain, and there was no more blood in the urine. It seems as if the obstruction to the ureter must have been dislodged in the course of operative manipulations. Since then he had been operated on in another hospital for hernia.

CALCULI IN A HORSESHOE KIDNEY.

Dr. Clarence A. McWilliams presented a man, 36 years old, who was first seen two years ago. He had had vague attacks of discomfort in the left upper abdomen for probably ten years, but for the past two years these attacks had come with greater severity and at intervals of about three months. They began usually in the early morning, with uncomfortable pains in the left side of the back, extending around to the front of the abdomen, but not as far as the groin or penis. Some of these attacks developed into severe colic, doubling him up and requiring morphine. Following the attacks there would remain for a number of days soreness in the back. He never noticed any blood in the urine nor any disturbance in micturition. He had lost no weight. Between the attacks he was perfectly well, excepting for occasional soreness in the left kidney region.

On January 31, 1907, an X-ray photograph clearly showed the presence in the left kidney of four calculi, each of about the size of a lima bean. The single upper stone was separated by about an inch from two calculi which lay close together, and these in turn were about an inch distant from a single lower stone. Operation, although advised, was put off. Four months later another X-ray photograph showed the stones even more clearly, and separated a little further from each other. An X-ray was also taken of the course of the ureter, but it was found to be free of calculi.

In February, 1908, one year after the patient was first seen, he finally consented to an operation. His urine at that time had a specific gravity of 1023; it was acid and contained a large amount of sediment composed of oxalates and amorphous phosphates; indican was present in excess, also albumin, pus, and red blood-cells, the latter being both altered (colorless) and unaltered (possessing hæmoglobin); and a large number of mucous shreds, many containing leucocytes. The inorganic salts, the chlorides, phosphates, and sulphates, were all increased above the normal amounts. Peculiar concretions of ammoniomagnesium phosphates were observed; this, together with the excessive secretion of oxalates, might have had a bearing on the formation of the renal calculi. There was no increased frequency of micturition.

Operation, Feb., 1908.—An oblique incision was made, beginning just below the rib margin, extending from the outer edge of the erector spinæ downwards and inwards to just within the anterior superior spine. This incision, which at first was small, later had to be twice enlarged downwards. The kidney seemed to be somewhat prolapsed and presented at once when the fat was torn through, care being taken not to injure the fibrous capsule, so as to limit bleeding. Great difficulty was experienced in drawing the kidney into the wound. The upper pole was easily separated from its fatty capsule, but below something seemed to bind the organ firmly in its place. It was finally recognized that this was a firm mass of tissue, continuous with the kidney substance itself, which tapered out into a tail about an inch and a half wide. This curved inwards and crossed the spinal column transversely, and it was then recognized as a horseshoe kidney. The ureter passed behind this central mass. The kidney could be brought into the wound only to a slight degree, so that further procedures had to be performed in a cavity which was unusually deep because of the obesity of the patient. Palpation of the kidney, with the fingers and thumb on opposite sides, revealed the presence of calculi only by a grating which was clearly appreciated, but the calculi themselves could not be felt. The pedicle was isolated, a soft rubber catheter was passed around it, drawn tight, and clamped, with the object of controlling the hemorrhage. An incision was then made along the convex border of the kidney. This was followed by a very free hemorrhage which ceased on drawing

the catheter tighter. Four stones were found in three calices, two being adjacent to each other in the central calyx, and producing the grating sensation already referred to. By breaking through the kidney tissue, the four calculi were easily removed with the finger. The kidney surfaces were brought together with five plain catgut interrupted sutures passed through the kidney substance, and a cigarette drain was placed down to the lower extremity of the cavity. The abdominal wall was closed in layers with chromic catgut sutures.

At the completion of the operation, which occupied one hour, the patient's pulse was 80, but weak. On the second day the escaping urine wet the dressings and this continued for about ten days, necessitating changing the dressings three times in twenty-four hours. Ten days after the operation, 58 ounces of urine were passed, and a specimen of the total output for twenty-four hours showed it to be turbid and red in color; acid, sp. gr. 1012, with the chlorides, phosphates, and sulphates all below the normal. The urine contained a large amount of albumin and blood, a trace of pus, with hyaline, granular, epithelial, waxy, and blood casts.

The patient's recovery was uneventful, and he left the hospital on the twenty-fourth day. Two weeks later the urine showed but a very small trace of albumin, no blood nor pus, and a few granular and hyaline casts. It was six weeks, however, before the sinus left by the wound finally closed. This Dr. McWilliams attributed to a slight infection from the pelvis of the kidney of the large cavity made at the time of the operation.

The man's present condition, one year after the operation, was entirely satisfactory. An examination of the urine made on Feb. 9, 1909, showed it to be perfectly clear, acid, sp. gr. 1016; no indican, blood, nor pus; no casts nor crystals; and a normal amount of urea. There was no disturbance of micturition.

The speaker said that on looking up the subject of horseshoe kidney, he found that it occurred 30 times in 21,218 autopsies, or once in 707 cases. In all but two of these, the band of renal tissue joined the lower poles of the two kidneys, while in the two the upper poles were so united. The great vessels habitually lay behind the central transverse mass, and, as a rule, and unlike the case he had shown, the ureters descended in front of it.

INTESTINAL OBSTRUCTION DUE TO GALL-STONES.

DR. WILLIAM A. DOWNES presented a woman, 62 years old, who was admitted to St. Francis Hospital in the service of Dr. Kammerer on April 8, 1908. For the past ten years she had been subject to severe attacks of abdominal pain, most marked in the right hypochondriac region. The pain was usually relieved by home remedies and she did not recall having been treated by a physician. Her last attack had occurred some months before. She had never been jaundiced and there was no loss of flesh nor strength.

Seven days prior to her admission to the hospital she began to have a moderate amount of abdominal pain, accompanied by nausea and vomiting. The vomitus consisted of stomach contents and bile up to twenty-four hours before admission; then it became fecal in character. There had been no movement of the bowels since the vomiting commenced. On examination, the abdomen was found greatly distended, but not tender nor rigid. Her pulse and temperature were normal, and her general condition was fair.

Dr. Downes made a small incision through the middle of the right rectus, through which two fingers were introduced to explore the ileocæcal region. He came almost immediately upon a loop of intestine containing a hard body the size of a hickory nut, which proved to be a gall-stone. It was situated about ten inches from the ileocæcal junction. This loop of intestine was drawn out of the wound and an intestinal clamp placed across the gut proximal to the stone, which was then removed.

The vomiting ceased immediately after the operation, and flatus in large quantities escaped per rectum on the following day. On the second day, vomiting recurred and the patient again showed all the symptoms of complete obstruction. This was attributed to some defect in the original operation. Accordingly, the wound was opened and the operated loop of intestine drawn out. The suture line was found to be perfect, but the intestine below was collapsed and the same condition obtained proximally for about eight inches. At this point another foreign body was felt in the lumen of the gut, which proved to be a second gall-stone, considerably larger than the first. It seemed that the ileum from this point was unusually narrow, for it was with difficulty that the stone could be forced down into the collapsed portion.

In view of the poor condition of the patient, it was thought best to form an immediate artificial anus. A good-sized portion of the convex surface of the intestine at the site of the obstruction was sutured to the peritoneum, an incision was made, and the gall-stone removed. A large rubber tube was introduced into the proximal loop and held in place by suture.

The patient's further convalescence was uninterrupted. Two attempts were made to close the fecal fistula, but without success. It was then decided that the easiest and surest way would be to exclude the narrow portion of the ileum, including the fistula. On July 2, 1908, through a left rectus incision, he formed a lateral anastomosis between the ileum, about twelve inches proximal to the fistula, and the sigmoid. This diverted the fecal current completely for about six weeks, and then the fistula began to discharge off and on. On August 27 he exposed the loop of gut, including the fistula, and found the gut too narrow to do an end-to-end suture. He thereupon closed the ends and did a lateral anastomosis. Since then the patient had remained perfectly well.

OPERATION FOR DOUBLE HALLEX VALGUS.

DR. ROBERT H. M. DAWBARN presented a patient for whom he had operated for the relief of double hallex valgus. In connection with this case, Dr. Dawbarn described and demonstrated the various steps of the operation which he had found successful in dealing with this deformity.

OBSERVATIONS ON RENAL AND URETERAL CALCULI.

DR. GEORGE WOOLSEY read a paper with the above title, for which see page 670.

DR. F. TILDEN BROWN said the case reported at this meeting by Dr. Eliot as well as one of Dr. Woolsey's cases conclusively demonstrated that no matter how efficiently an application of the X-ray was made, and no matter by how expert a professional the plates were interpreted, it was at times impossible to say whether a shadow represented a ureteral stone, or one of these resembling bodies. In Dr. Eliot's case, the appearance and location of the shadow in relation to the spine of the ischium, taken in conjunction with the presence of a stone in the bladder, made it very probable that the dealings were also with a stone in the ureter; but this was subsequently shown to be erroneous. In Dr. Wool-

sey's case also it was only by surgical exploration that the identity of the shadows was shown, or could have been proven to be what it was.

Dr. Brown said that in one of his own cases two of the leading X-ray exponents in New York were strongly of the opinion that a certain shadow along the line of the ureter was not a stone, while personally he was inclined to believe that it was. That fact was subsequently confirmed by the use of X-rays in conjunction with the styletted catheter, which he looked upon as superior to any other method in the differential diagnosis of these often puzzling cases.

In discussing drainage of the abdomen and viscera, Dr. Brown said that where the ordinary scissor-backed rubber tube was employed—unless it was so soft and flabby as to be useless—he believed that it was an object of danger. On the other hand, he thought it was a mistake to condemn all tubal drainage and insist on the use only of the cigarette or gauze drain. If one used some form of smooth-eyed catheter, or particularly the Carlton angled tube or catheter, the serious consequences that are being reported would probably be obviated.

In connection with this general subject, Dr. Brown exhibited an X-ray picture showing a congenital diverticulum of the bladder which had given rise to symptoms simulating those of a ureteral calculus. These might also be produced by certain intra-abdominal lesions. He agreed with Dr. Woolsey that when once the diagnosis of ureteral stone had been made, we should not be in too great a hurry to operate. One method of treatment that he had found efficacious in some cases was to introduce a ureteral catheter beyond the point of obstruction and then inject some form of oil or water, hoping by either the catheter's stretching, or the changed position of the stone, or the back pressure produced by the fluid to hasten the descent of the calculus. In most instances, early delivery of the stone would follow this manipulation, while in other cases its further descent would result and could be demonstrated by the X-ray observations. In the case reported by Dr. Mathews, where no ureteral stone was found in spite of the immediate and complete disappearance of symptoms, the calculus might have become displaced from the pelvic end of the ureter into one of the calyces, or it possibly escaped at the time of the rupture of the kidney pelvis. The danger of hemor-

rhage from the cortex of the kidney, to which one of the speakers referred, could usually be easily controlled either by pressure or by a single suture, but when we had to deal with a stone the removal of which necessitated the tearing of the neck of the calyx, vessels of considerable size are involved and their injury had been followed by dangerous and even fatal bleeding. The choice of routes for removal lies of course in a longitudinal slit in the posterior wall of the pelvis.

Dr. L. W. Hotchkiss reported the case of a woman whose symptoms pointed to a stone in the kidney. An X-ray was taken, which showed a stone of fair size apparently lying in the pelvis or upper ureter. Upon operation, no renal or ureteral calculus was found, and further exploration revealed a movable liver, with a low-lying gall-bladder. This contained a biliary calculus, and rested upon the upper part of the right ureter.

Dr. F. K. Murray said that the use of the X-ray has been of great assistance in making a correct diagnosis; and when combined with a careful study of the clinical history of the case, the diagnosis should be made in the majority of cases. As there is no single symptom or group of symptoms which can be considered as characteristic of stone in the kidney or ureter, a diagnosis founded upon the study of symptoms will be more or less uncertain. Reliance solely on the X-ray examination will be disappointing at times; and in the use of this means of diagnosis an expert photographer furnished with the very best apparatus is indispensable. The use of the compression diaphragm is of great assistance; and in several cases of his its employment had clearly detected stones which were very faint or absent when pictures were taken without using the diaphragm.

Stones of considerable size may exist in the parenchyma of the kidney without giving rise to symptoms, and their presence is only detected by the use of the X-ray. A few years ago, he saw a lady who had a sinus in the right lumbar region following the opening of a large abscess some time previously. As the urine was persistent and led directly down to the lumbar vertebræ, it was considered a bone lesion, probably of a tuberculous nature. There were no symptoms which would lead one to suspect the kidney, but he had an X-ray picture taken after injecting the sinus with bismuth. The sinus was found to move towards the spine and then turn at right angles towards the kid-

ney, where it divided into two branches, each of which led to a good-sized stone in the parenchyma.

Just a brief reference to a case in which a renal calculus was detected by the X-ray, while the symptoms were due to another lesion. An elderly man had complained for three years of pain and soreness in the region of the left kidney, and as medical measures had failed to give him relief, he demanded operation. Beyond the existence of a pyelitis nothing apparently definite was found until an X-ray picture revealed a small stone in the parenchyma. In the course of a nephrolithotomy a small abscess was found in the lower pole and opening into the pelvis of the kidney. Cultures of the pus from the abscess gave a pure culture of the typhoid germ; and on autopsy some ten days afterwards similar results were obtained from cultures taken from the abscess cavity and the hilus of the kidney. Cultures from the hilus of the opposite kidney were sterile. It was a case of typhoid abscess and pyelitis, not one of calculus, as the stone was a very small one and had practically caused no destruction of the parenchyma. The man had had two attacks of typhoid fever, one sixteen years ago, the second five years ago, and he undoubtedly had been carrying and spreading typhoid germs for at least three years. Cultures of the blood were also negative, and death was due to bronchopneumonia.

Concerning the treatment of ureteral calculus, an expectant attitude would be maintained, where the X-ray reveals a small stone, as in the majority of cases they are passed naturally in the bladder.

AN IMPROVED IODOFORM EMULSION.

Dr. Theodore Dunham, in exhibiting a specimen of this improved emulsion, said that his purposes in modifying the iodoform emulsion, or more accurately, suspension, had been two: in the first place, to produce a sterile emulsion; and in the second place, one which should be immediately antiseptic, before the decomposition of the iodoform began to take place. It had been shown that iodoform itself was not an antiseptic, but owed its antiseptic property to its ready decomposition, with the liberation of iodine. It was, therefore, possible that iodoform powder might chance to contain pyogenic organisms. An emulsion made by mixing iodoform powder with glycerin could not be satisfactorily

sterilized by heat, for on the application of heat the iodoform lost its finely divided state and passed into a condition of coarse particles, and there was no longer a fine emulsion or suspension. Dr. Dunham said his two purposes of producing a sterile and antiseptic emulsion had been accomplished by adding free iodine to the mixture, depending upon the iodine to sterilize the iodoform and also to act at once as an antiseptic in the wound. The iodine was held in solution by potassium iodide.

The emulsion was prepared as follows: To 100 c.c. of glycerin he added one gramme each of pure iodine and of potassium iodide. The vessel containing these three ingredients was placed in an Arnold sterilizer. After the sterilizer had boiled for a time, the mixture was shaken, when it would be found that the iodine had gone into solution. The solution was allowed to cool. Ten grammes of powdered iodoform were then incorporated with the solution by grinding in a sterile mortar.

Dr. Dunham said he devised this emulsion a number of years ago and had used it in many obstinate suppurative conditions with such satisfactory results that he thought it worth reporting.

TRANSACTIONS

OF THE

PHILADELPHIA ACADEMY OF SURGERY.

Stated Meeting, February 1, 1909.

The President, Dr. William J. Taylor, in the Chair.

OBSTRUCTION OF BOWEL AFTER REDUCTION OF A STRANGULATED FEMORAL HERNIA.

Dr. Edward B. Hodge reported the history of a woman, aged 59 years, who was admitted Nov. 4, 1908, to the Presbyterian Hospital, in the service of Dr. W. L. Rodman, complaining of abdominal pain and vomiting. For four years she had had a painless lump in the left groin, the size of a walnut. This never disappeared or changed in size. Three days before admission, the lump became painful and a little larger. She began to have abdominal pain, diffuse at first, localized to the epigastrium in the last twenty-four hours. Vomiting appeared early, and lately has occurred every 15 to 20 minutes. It was not fecal. There has been no bowel movement since the attack began. A small mass was felt in the region of the left femoral ring; it was not tender.

A diagnosis of strangulated femoral hernia was made and immediate operation performed.

A two-inch vertical incision exposed the sac of a femoral hernia, containing a loop of dark purple small intestine. The constriction was relieved by several nicks about the circumference of the ring, a few recent adhesions were loosened, and more bowel pulled down. One limb showed a band darker than the rest, ¼ in. wide and two-thirds around the bowel. Under hot moist sponges the circulation returned except in this band and a small spot, ⅛ in. in diameter, an inch or two from it. Acting on a suggestion of Summer's, this suspicious band of gut was invaginated into the healthy intestine by silk Lembert sutures, reinforced by a continuous silk suture. The small area was turned in by a silk purse-string suture reinforced by one or two inter-

rupted sutures. The intestine was replaced in the abdomen, and the wound sutured with interrupted silkworm gut around a cigarette drain. The patient left the table in good condition, with a pulse of 110.

She did well for two days, when vomiting began. This steadily increased, as did distention. No flatus was passed, and on the fourth day distended intestinal coils, with visible peristalsis, could be made out. The pulse began to rise, with normal temperature. Mechanical obstruction was evident. Ninety-six hours after the first operation, the abdomen was opened in the median line above the pubis. There was considerable clear, bloody fluid in the pelvis. Coils of collapsed and of moderately distended small intestine presented. A finger passed to the region of the femoral ring showed no great swelling, but the bowel was adherent to the paries, and there seemed to be a sharp angulation. Acting on Dr. Rodman's suggestion, no attempt at resection was made, but, without disturbing the adhesions, lateral anastomosis was done with clamps between the afferent and efferent loops, as close to the site of the obstruction as allowed easy delivery in the wound; No. 1 chromic gut was used for the inner row of sutures and No. 2 Pagenstecher for the outer. The latter was reinforced at one or two points with interrupted sutures. On removal of the clamps gas passed freely from the afferent to the efferent loop. Gauze in a split rubber tube was used for a drain. The abdomen was closed with through-and-through silkworm gut, and continuous No. 2 chromic catgut in the fascia.

The patient left the table in fair condition and did well thereafter. Flatus was passed in a few hours. The distention steadily lessened and vomiting did not occur. No attempt to move the bowels was made. At the end of a week they moved naturally. Her further convalescence was uneventful.

PERFORATING PYLORIC ULCER.

Dr. John H. Jopson related the history of the following two cases:

Case I, male, aged 43 years, was admitted to the Bryn Mawr Hospital April 13, 1906. He was by occupation a gardener; used tobacco and malt liquors freely. He had suffered for ten or fifteen years from indigestion. Pain and discomfort were present in the epigastric region, most marked about two hours after a

meal. He never vomited, and there was no history of bleeding. He attributed his present attack to the recent ingestion of considerable quantities of porter. On the evening before admission, after eating his supper, and while lying down smoking, he was seized with sudden, severe abdominal pain, which persisted, in spite of treatment during the night; and he was admitted to the hospital at 9 A.M. of the following day.

His temperature on admission was $101^{2}/_{5}°$, pulse 60, respirations 20. He was seen by Dr. Jopson in the evening of the same day in consultation with Drs. Christie and Laird. His general condition was excellent, temperature $99^{3}/_{5}°$, pulse 72, respirations 18. At this time his symptoms were those of acute appendicitis. The pain, tenderness, and rigidity which were present were most marked in the right iliac region. There was moderate tenderness and rigidity in the right hypochondrium, and the possibility of a gastric perforation was considered and discussed; it was considered unlikely, however.

He was operated upon at 8.30 P.M., twenty-four hours after the onset of his acute illness. Right iliac incision. A small quantity of gas escaped on opening the peritoneal cavity, and there was considerable free turbid fluid in the abdomen. The appendix was picked up and found normal. The incision was at once extended upward and the pyloric region explored. Patches of lymph on the intestine were noted in this direction. A small perforation at the pylorus was detected. It was apparently on the stomach side of the pylorus. It was small, not much over pinhead size, circular, and was easily closed by a purse-string suture of silk, reinforced by Lembert sutures. The pelvis was drained by cigarette and glass tube, and the pyloric region by iodoform gauze. The wound was drawn together by several through-and-through silkworm-gut sutures. The patient stood the operation exceedingly well and without shock. His pulse soon fell to below 100, and the temperature remained around 99° and 100° for a couple of days, and was thereafter normal. He was treated in the sitting posture with continuous enteroclysis, and nourished by rectal enemata for several days before mouth-feeding was begun, malted milk, a favorite rectal nutrient at the Bryn Mawr Hospital, being used. He was in the hospital six weeks.

It is now nearly three years since the operation. The man did not resume his usual work for nearly a year, but he has since that time been at active work as a gardener in his old place. He

says he is quite well, except for some tendency to fermentation and gas; eats heartily; smokes heavily; has no pain referred to his stomach. His health is very much better than before his illness, but he has some pain in the right side after stooping or heavy lifting, probably from adhesions.

CASE II.—Male, white, aged 52, was admitted to the Presbyterian Hospital Nov. 21, 1908, with a diagnosis of perforated duodenal ulcer. His previous history showed him to be an active man, of somewhat irregular habits, periodically indulging in alcohol to excess, but not a steady drinker. Uses tobacco to excess. He gives a history of gastric trouble dating back for about twelve years. His symptoms consisted of eructations, gastric pain, and distress before meals and at bedtime, and gastric pain and nausea coming on several hours after a meal, which would be relieved by the taking of food, only to return after three or four hours. Vomiting was often self-induced to relieve gastric distress and hyperacidity. These symptoms have been growing worse for two or three months. There has been no marked loss of weight, and he has been able to attend steadily to his work, which involves considerable walking.

On the day of admission he had submitted to a stomach examination for diagnosis, a stomach-tube being passed by his physician after usual test breakfast, and the following data obtained: Free HCl, 0.26; total acidity, 0.39. Lactic, butyric, and acetic acids absent. Bile absent, and pepsin in normal amount. Microscopic examination showed many starch granules, broken and unbroken, and occasional epithelial cells. A blood examination at this time showed 90 per cent. hæmoglobin, and 4,500,000 red cells, with 8,400 whites. Four hours after the test breakfast he took a lunch of eggs, toast, and tea; and while walking home an hour thereafter was taken with sudden, agonizing abdominal pain and retching. He was unable to proceed, and was taken home in a patrol wagon. He was seen by Drs. Bryan and Turnbull, and later by Dr. W. E. Hughes, who made a diagnosis of duodenal ulcer with perforation. Pain was with difficulty controlled by large doses of morphine. He was admitted to the Presbyterian Hospital at 11.30 P.M. At this time, nine hours after onset of pain, he was in good condition; temperature $98^{3}/_{5}°$, pulse 124. The pain had been partly controlled by morphine. The abdomen was of board-like rigidity, and the upper half very tender, the tenderness most pronounced on the right side. There was no distention. No vomiting, but some retching.

Operation, eleven hours after onset. Right rectus incision. There was immediate escape of gas on opening the peritoneum, followed by free and persistent expulsion of great quantities of turbid fluid which had been confined under pressure in the rigid abdomen. The entire abdominal and pelvic cavities were filled with this exudate. A large ragged opening in the anterior wall of a much infiltrated pylorus was easily found. It admitted the gloved index finger, which easily passed into the duodenum. It could not be stated definitely that the perforation was to the duodenal side of the pylorus, which was deeply fixed in the abdomen. There was much lymph over the pyloric end of the stomach and the duodenum. Owing to the fact that the pylorus was practically torn in half by the ulceration, some uneasiness was experienced as to the possibility of closure by sutures. With care, however, it was successfully and apparently tightly closed by a double layer of Pagenstecher sutures applied in interrupted fashion—the first layer, through-and-through stitches of the edges; and the second, covering in this with Lembert's. The lesser omentum was pulled down over the wound at its upper angle. A suprapubic opening was then made and a glass tube inserted into the pelvis. The peritoneum was thoroughly flushed until clear fluid returned from both wounds. A cigarette drain and two strips of gauze drained the pyloric region, and the upper and lower parts of the wound were sutured. A glass and rubber tube were left in the pelvis.

The patient was not in the least shocked by the operation, his pulse being only 104 when removed from the table. He was placed on the Fowler-Murphy treatment, and nothing given by mouth for 40 hours. He was fed for several days by nutritive enemata, and mouth-feeding started after three days. He was in bed three weeks, and left the hospital at the end of four weeks. He has continued to gain in weight and strength. His diet is now a fairly generous one. He has a little fermentation at times, but has no pain to speak of. He still, at the end of two months, has a narrow sinus in the upper wound.

Dr. Jopson remarked, further, that he had sutured three gastric ulcers which had perforated, all in middle-aged men, and located in or near the pylorus, and all had recovered. As to the exact location of the perforation, and whether it is on the stomach or duodenal side of the pylorus, it is difficult in these perforated cases to state, as Eliot has recently emphasized. The pylorus is often

the site of so much œdema, and is so deeply fixed in the abdomen, that it is frequently impossible to say that an ulcer is on this or that side of the dividing line. The symptoms of the perforation in any event are the same. For the first few hours the localized tenderness and muscle spasm are especially pronounced in the abdominal wall over the site of perforation; but after this, as the infectious material gravitates down along the right side of the abdomen and as the peritoneal inflammation accompanies it, the symptoms in pyloric and duodenal perforation later become those of the usual right iliac inflammation, appendicitis; and hence we find a larger number of cases seen late diagnosed as appendicitis. In his first two cases, seen twenty-four hours or more after perforation, this diagnosis was made. An appendix incision, extended upward sufficiently far, gives good exposure and good drainage of the infected right abdomen. When the perforation is in other portions of the stomach, late cases show, perhaps, only general peritonitis. Some years ago he operated on a case of this type, with advanced general peritonitis, in which the lesion was found only at autopsy.

Of the methods of closure of the perforation little need be said except, as in the last case, in connection with the suture of large perforations, where tamponing, omental flaps and plugs, overlapping by neighboring organs, and even gastrostomy have been suggested, although the last-mentioned has given very poor results. Jejunostomy has been recommended for perforation by Von Eiselsberg, to relieve tension and put the stomach at rest; and he and his associates have so treated 12 cases with 5 recoveries. Excision, pylorectomy, or pyloroplasty have also been recommended and practised. The most vital question is, of course, as to the performance or non-performance of gastro-enterostomy after closure of the ulcer. Moynihan advises it in cases seen early and in good condition; while Eliot, as a result of careful, recent study, advises against it as a primary measure, on account of the slightly greater mortality, and the fact that the after history of these cases shows practically as little danger of recurrence as do cases subjected to primary gastrojejunostomy without perforation. He advises waiting until subsequent (and unusual) symptoms may demand it.

Hemorrhage from, and perforation of other ulcers has occurred both early and late after suture of perforated ulcers, and persistent gastric symptoms have called for secondary and

usually successful operation; but it is true that the majority of cases that recover from the acute attack of perforation remain well without gastro-enterostomy being required. In perforated cases operated upon after twelve hours, few would advise it. Eliot analyzed 51 cases treated by gastro-enterostomy with 33 recoveries and 18 deaths, a mortality of 35.5 per cent., and not a bad showing. Eighty-two cases sutured, without gastro-enterostomy, gave a mortality of 34.1 per cent. Whether gastro-enterostomy is indicated except when suture of the ulcer causes excessive narrowing of the pylorus, is still somewhat of a question. It would seem to be justifiable to surgeons of special experience in cases seen early after perforation and in good condition. He had been much impressed with the absence of shock in his cases. Indeed the operation could have been reasonably prolonged in all three without serious detriment to the patient.

PERFORATED GASTRIC ULCER.

DR. MORRIS BOOTH MILLER related the history of a man, aged 32, who was admitted to the Polyclinic Hospital on October 2, 1908, about seven o'clock in the morning. All the history obtainable at that time was to the effect that at about eleven o'clock the previous night he had been suddenly taken ill with severe pain in the right side of the abdomen followed by moderate vomiting. He was promptly seen by Dr. Henry Tucker and later by Dr. David Riesman, both of whom advised that he be sent to the hospital without delay. This advice was not accepted; but as his condition grew worse during the night he was finally removed to the Polyclinic early in the morning. Prior to operation he was unable to give any account of previous ill health; but during his convalescence he gave them the interesting data that for over a year he had suffered at frequent intervals from epigastric pain, distention, gaseous eructations, and constipation, and that, further, he had been seen during this time by Dr. William E. Hughes, who had diagnosed gastric ulcer and had spoken of operation.

When admitted to the hospital he presented to a striking degree the clinical picture of abdominal disaster. He was pinched, anxious-looking, and blanched, sweating slightly, and evidently in great pain. The temperature was $96\frac{4}{5}°$, pulse 92, respiration 32, The belly walls were sunken, board-like in texture, and the rigidity seemed equal on both sides. He located the maximum of pain on the right side and about the umbilicus. Immediate operation was

undertaken and inasmuch as a provisional diagnosis of acute perforating appendicitis had been made one incision was made in that area. There escaped at once a considerable quantity of turbid fluid containing flocculent particles, but aside from the pervading congestion the appendix was normal. An incision was then made through the upper right rectus, and at once the characteristic sound of air sucking in and out was apparent. With no difficulty the perforation was located on the anterior and under surface of the stomach about one inch from the pylorus. The opening was punched-out, irregular in outline, hardly large enough to admit a pencil and it apparently had occurred not at the centre of but near the pyloric edge of an indurated area about an inch in diameter. One through-and-through suture closed the perforation, and the whole ulcer was turned in with a continuous Lembert suture in the general axis of the stomach. Gastrojejunostomy was considered, but not done, as his condition would hardly warrant it. A rapid search revealed no evidence of other ulcers. An additional opening was made above the pubis for pelvic drainage; and after a quick toilet by mopping, thorough drainage by wicks and split rubber tubes was established at all three incisions.

When sent back to the ward he was placed in a semi-recumbent posture and enteroclysis with normal salt solution was continuously used for nearly a week, with its usual admirable results. Aside from a bronchopneumonia which appeared the next day and which lasted four or five days, his convalescence was uneventful and he was discharged on the twenty-ninth day. He has since been under observation and there has been no recurrence of his former gastric symptoms. This case may be placed on record as having been operated on nine hours after perforation.

Dr. John B. Deaver said that in cases of perforating gastric ulcer the question of diagnosis in many instances is an uncertain one. Many cases of perforation had been diagnosed as appendicitis, but as experience grows richer such errors are less liable to occur. Personally he did a posterior gastrojejunostomy in the majority of instances. He never hesitated on account of the patient's condition, because the operation adds practically nothing to the risk. In these cases of excessive indurations, as in Dr. Jopson's case, it is a safer procedure. The cases that he had been able to follow had been entirely relieved of digestive disturbances, eructation of gas, hyperchlorhydria, etc. He always drained suprapubically, but rarely at the point of attack. He never

flushed the abdomen. Most of his cases had been duodenal, and all had recovered. It is a safe operation certainly within 36 to 48 hours. The percentage of mortality is not large. Posterior gastrojejunostomy was especially indicated in cases where there is much induration and where one cannot be sure about the lumen of the duodenum or of the pylorus, as the case may be.

Dr. John H. Gibbon said that he had had eight cases of perforating duodenal and gastric ulcer with three recoveries, which, according to statistics, is about the average. The mortality rate will depend largely upon the time at which the operation is done after the perforation has occurred. In one of his cases he was fortunate enough to operate within a few hours, and in another within nine hours after perforation, and each of these recovered. In one case, done thirty hours after perforation, the patient died on the twenty-fourth day from a pelvic abscess due to faulty drainage, and in spite of the subsequent drainage of this abscess. All of the cases which had gone over thirty hours before operation died, most of them being very ill from an extensive general peritonitis.

The general practitioner needs to be impressed with the importance of prompt operation in all cases of acute abdominal crises. In his last case, operated upon a few weeks ago, thirty hours had elapsed since perforation and the patient had received a grain of morphine during the previous night for his severe abdominal pain. This greatly masked the symptoms and in this way influenced the fatal result. In the early cases of perforation, where there is little extravasation, or where there is a small opening and none of the contents have escaped, a gastrojejunostomy is contraindicated unless the pylorus is obstructed by the ulcer. Drainage, where extravasation of the gastric and intestinal contents has taken place, and where more than a few hours have elapsed, should be employed, both at the site of perforation and perhaps also suprapubically. He thought that none of the cases which he had lost could have been saved by the additional operation of gastrojejunostomy. This operation in the presence of an extensive peritonitis opens up the lesser peritoneal cavity to infection, and where the patient is in bad condition greatly jeopardizes his chances of recovery. In one case which recovered from an acute perforation, he had to do a gastro-enterostomy eighteen months later for a return of symptoms; but this is not the rule unless the ulcer is situated at the pylorus and produces obstruction.

The secret of success in these cases is the same as in acute appendicitis, namely, early operation. It is not so much a question of technic as it is of getting at the case early. Where a gastro-enterostomy is not done the important point in the postoperative treatment is the keeping of food out of the stomach and feeding the patient by the rectum.

Dr. Robert G. Le Conte did not believe there were many cases of gastric and duodenal perforation which require an immediate gastro-enterostomy. The object of an immediate gastro-enterostomy is to drain the stomach during the period of healing of the ulcer and to afford a new outlet for food, when closing of the perforation has produced a stenosis of the pylorus. The same results, however, may be accomplished for two or three weeks without gastro-enterostomy, by withholding all food from the mouth and feeding the patient by the rectum. Where the ulcer has a large indurated base, and is situated near the pylorus, its closure contracts the pyloric opening; but this contraction is frequently a temporary one, which is relieved as the indurated area is absorbed. In such a condition, then, if gastro-enterostomy is done at the time of closure of the ulcer, the patient is subjected to the immediate risk of an operation prolonged for, perhaps, twenty minutes, and the ultimate probability of a useless opening in the dependent portion of the stomach when the pylorus has returned to its original calibre. He recalled a case of Dr. Gibbon's, where a firm closure of the ulcer could not be secured by direct suture, and an omental patch was used to re-enforce the closure. This case made a perfect recovery without gastro-enterostomy, by withholding all food from the mouth for a period of three weeks. Mayo has twice lately in chronic gastric ulcer deliberately cut out the base of the ulcer with a sharp knife, and then closed the defect, producing the picture of an acute perforation. The immediate results have been most favorable, without a gastro-enterostomy.

As to lavage of the peritoneal cavity in these cases, in peritonitis following appendiceal perforation he did not usually wash the peritoneum; but in a gastric perforation, with the possibility of particles of undigested food having entered the peritoneum, he believed that lavage often does good, for he had in such cases washed out bits of meat and tomato skins which he felt confident would have been a source of trouble had they been allowed to remain within the peritoneal cavity.

DR. ASTLEY P. C. ASHHURST said that two points which had arisen in this discussion were illustrated in an unusual manner in the case of a patient with duodenal perforation on whom he had recently operated at the Episcopal Hospital in the service of Dr. Frazier: first, the differential diagnosis from appendicitis; and second, the question of irrigation and drainage. In the patient under Dr. Ashhurst's care Dr. Frazier had removed the appendix during an acute attack just one year previously; and in the present illness this fact tended to confuse the diagnosis, for the patient was thought to be suffering from intestinal obstruction resulting from his previous operation. On opening the abdomen in the suprapubic region, however, the true condition was manifested by finding fecal matter free in the peritoneal cavity. An incision was then made in the epigastric region, and the perforation (of the duodenum) sutured, about seven hours after perforation occurred. A culture from the fecal matter in the lower abdomen remained sterile. This seemed an important point in relation to the question of irrigation and drainage; but as it was not known at operation that this matter was sterile, the entire abdominal cavity was thoroughly irrigated, removing pieces of potato and other material, as well as quantities of flocculent lymph; and the abdomen was drained from both wounds. (A culture made a week later from the depths of the upper wound showed the presence of the colon bacillus.) Gastro-enterostomy was not done, as the peritonitis appeared too widespread to make prolongation of the operative justifiable. The patient made an uninterrupted recovery.

DR. JOPSON said, as to mortality, that the percentage of deaths in large series of cases of gastric and duodenal ulcers is not far from 50 per cent., although Moynihan reports twenty-four cases of gastric and duodenal ulcers with nine deaths, a mortality rate of 37.5 per cent. Eliot gives two series, one with gastro-enterostomy, and the other without, with a mortality of 34 per cent. or 35 per cent., being a little less in those cases in which the operation of gastro-enterostomy was not added to that of repair.

While he seldom used lavage in abdominal infections it seemed to him that in cases in which the abdominal cavity is filled with fluid which may be sterile, but is suspicious, it does no harm to replace it with a fluid which is known to be sterile. The procedure cannot spread infection, as the whole abdominal cavity is already involved. When abdominal infection is localized few

irrigate. In perforated gastric ulcers, however, the conditions are different.

Regarding the performance of gastro-enterostomy he recalled the case of a patient under the care of one of the Fellows of this Academy in which perforation occurred and was repaired and the patient died a few days after of perforation of other ulcers. Unfortunately the surgeon seldom sees these cases within the first few hours, when gastro-enterostomy would seem safe and easy; and after ten or twelve hours, when there is diffuse infection, one runs greater risks by an extensive and prolonged operation.

CONGENITAL MESENTERIC CYST.

DR. HARRY C. DEAVER reported the history of a congenital mesenteric cyst, and added a discussion of questions involved in such cases, for which see page 618.

DR. WILLIAM M. L. COPLIN said that he had not had opportunity to examine many of these cases at autopsy. He had seen Dr. Kalteyer at autopsy at the Philadelphia Hospital remove a chyle cyst; it was an accidental finding at autopsy without clinical data. He had also seen two other chyle cysts which were also accidental findings at autopsy; also serous cysts, one a true mesenteric cyst, the other they were not so certain about. There were peritoneal adhesions and he thought it had resulted from the closure of the serous membrane by adhesions that formed a sac. An epithelial lining would probably interfere with operative recovery. He had seen one of these cysts containing a stone. There was the suspicion that it might have been a tuberculous mesenteric lymph-node which had been surrounded by lacteal fluid.

OSTEOSARCOMA OF THE MANDIBLE.

DR. ADDINELL HEWSON reported the history of a case of osteosarcoma of the mandible, with remarks upon the management of such cases, for which see page 614.

GERMAN HOSPITAL SURGICAL CLINICS.

DR. JOHN B. DEAVER presented a report of the work done by him in his Saturday clinic at the German Hospital during 1907–1908.

BOOK REVIEWS.

DISEASES AND SURGERY OF THE GENITO-URINARY SYSTEM. By FRANCIS S. WATSON, Surgeon to the Boston City Hospital; Lecturer on Genito-Urinary Surgery, Harvard Medical School, etc.; assisted by JOHN H. CUNNINGHAM, JR., Surgeon to the Long Island Hospital, Boston. Two volumes. Philadelphia and New York: Lea & Febiger, 1908.

Volume I is devoted exclusively to diseases of the external genitals, of the prostate, and of the bladder. In the treatment of gonorrhœa the writer advocates the method of early treatment to destroy gonococci, or at least to inhibit their action, as soon as the diagnosis is made; and for that purpose recommends the use of five per cent. argyrol solution from the first. Very little space is given to the treatment of acute posterior urethritis. The authors devote more space to the treatment of stricture of the urethra, and the chapter on this subject shows the effect of the greater amount of interest that the writer has taken in the treatment of this phase of his subject. It is a pleasure to note in the earlier chapters that the writer has thrown aside the many useless methods of treatment of inflammations of the urethra, and gives short and pithy directions for the proper handling of the condition. The treatise takes up in turn operations on the penis, diseases of the vas deferens and spermatic cord, and abnormalities of the testicle. The illustrations of this part of the book are especially fine. A most interesting chapter in the second part of the book is that devoted to diseases of the prostate. The former extensive publications by the same author on the subject of prostatic hypertrophy are well known, and the chapter he has here presented is in many ways similar to that already published. He considers carefully all the various methods of treatment, including palliative treatment, continuous drainage of the bladder and bladder irrigations, perineal drainage, suprapubic drainage, and catheter life. The entire subject of hypertrophy of the prostate occupies relatively more space than one would suppose necessary in a

work of this size, but it is difficult to recommend what might be left out; it would seem, however, that the long historical *résumé,* the continued references to castration and vasectomy, which are now obsolete, could be omitted. The subject of galvanoprostatotomy is also thoroughly discussed, 120 pages in all being devoted to the subject. Next comes a chapter on cystoscopy. The various foreign cystoscopes are described, but none of the more modern instruments of American manufacture find a place; this chapter occupies but ten pages and is totally inadequate for such a work. The various diseases of the bladder are next discussed, but the subject of tuberculosis of the bladder is considered in the second volume on account of its intimate relation to renal tuberculosis. The more recent operations for transperitoneal resection of the bladder have not been introduced.

Volume II is devoted to the diseases and surgery of the kidneys and ureter, not including the medical diseases of the kidney. This portion of the work is especially well illustrated and is up-to-date in all respects.

The two most important features of the work are the operative surgery of the genito-urinary tract and the full series of statistical data which are given in relation to the various subjects. All clinical cases have been excluded from the text and are grouped at the ends of the chapters; as well as all references to literature, which are placed in the bibliography at the ends of the chapters. The illustrations throughout are of the highest character, and are partly anatomical and partly diagrammatic.

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